NEWS IN PERSPECTIVE

JUNE 1, 1961

ECONOMIC CLIMATE

EXPANDING PHASE of the economy seems here, though there is still some doubt as to how high it will go. Restraint in monetary policy has given way to ease, and the Treasury clearly wants interest rates to drop a fraction further. The Federal Reserve Board—always cautious—is reluctant to take more active steps to force up government bond prices, thereby cutting their yields. This would tend to press banks to the defensive if they did not lower the prime rate.

TREND TO FIRMNESS in business activity can be seen all along the line. Personal income, which never dropped below its year-ago rate, has begun to rise. Hours of work—an early harbinger of change in economic direction—have started to increase. Manufacturers' new orders are going up, and sales to consumers are quite satisfactory. Inventories are believed to be approaching bottom. Though liquidation continues, it has shifted from manufacturing to trade.

TOTAL OUTPUT of goods and services is close to the all-time peak of $505-billion a year; it is now at the rate of about $503-billion. But allowing for normal factors involved in business growth, it will take about a $30-billion expansion just to stay even with the current employment situation. To reduce the number of jobless by 1.5-million, the U.S. will have to be turning out goods and services at the rate of about $545-billion a year by the first quarter of 1962. Though this would be a sharp rise, it is not unprecedented. The U.S. grew this fast in 1955 and again from the spring of 1958 to the spring of 1959.

MANAGEMENT VIEW

BUILT-IN CORPORATE STABILITY—This asset of the investor-owned utility was mentioned by chief executives of many a power company in annual stockholder meetings this year, as nearly all looked ahead to early economic recovery in their service areas. Most (like Philip Sporn, Allen S. King, D. E. Ackers, Joseph M. Bell, Jr., for example) also referred to the importance of "balanced economy" in the communities served as the strongest resistance to recessionary pressures. Typical comment: "Signs of improving business are becoming more apparent daily...and we expect our area and the company to participate fully in the recovery"—the view of Cleveland Illuminating's R. M. Besse.

HOW U.S. POWER NEEDS will be met through the year 2000, without government money is to be demonstrated in a newly prepared slide-film presentation which EEI will have ready for nationwide distribution by next month. The investor-owned utility industry's story is emphatically supported by the dramatically illustrated sequence of growth in network interconnection.

"PROCEEDING ACCORDING TO PLANS" is the description of 1961 generating capability increases in the latest EEI Electric Power Survey. The December, 1961, industry capability is expected to reach 188-million kw and the peak load is predicted to be 145-million kw. (As of April 1, the total capacity of new heavy power equipment on order and scheduled for shipment from domestic manufacturers was 29,061,339-kw. Backlog for electric generating equipment was up 9.8-percent over the figure for the first of '61. Total capacity of large power transformers on order and scheduled for shipment is higher than at any time since April of 1957.)

DOWN BY $207-MILLION, electric utility financing in the first quarter of 1961 compared with a sharp rise in telephone securities offerings (to a total of $1,650,000,000) and an increase of $20-million in gas utility financing. Total utility financing for the quarter was up 82-percent over the 1960 period.

NEW MARKETING CONCEPTS are needed to restore the public's faith in the marketing methods of business, Detroit Edison's E. O. George told the convention of the Public Utilities Advertisers Association last month.

NEWS IN PERSPECTIVE

"We need some bold thinking to improve the concepts of products we are asking you as advertising men to sell," he proposed. Expressing concern for the attitudes of Americans about marketing methods, Mr. George suggested that utilities are not only free from possible criticism, but "may be too ethical for their own good..."

FAVORABLE PERSONALITY OR IMAGE is being built today for public utilities with the help of a multi-million dollar advertising investment in television advertising ($12.3-million in '60), according to statistics of the Television Bureau of Advertising. A total of 164 public utilities used various TV campaigns in 64 markets alone, the Bureau reports. Comments PG&E's Adv. Mgr. A. James McCollum: "TV has given the utility industry a device to bring back yesterday's successful door-to-door salesman, who found that the best way to sell appliances is to demonstrate them."

ELECTRIC SALES OUT WEST are making "substantial progress," a panel of top marketing executives of California and Arizona utilities agreed in a recent presentation for the PCEA Business Development conference. What they want more of: sales promotion of electric heat, water heaters, adequate wiring... and greater sales attention to apartment house and hotel markets.

"INTENSIVE RESEARCH-BASED EFFORT is the key" to making atomic power an important factor in N. Y. State within this decade, according to Ernest R. Acker, president of Empire State Atomic Development Associates, Inc. The ESADA program is geared to the construction of power generating capacity planned to meet the state's growth requirements, he adds. "Atomic power can do much to stabilize and in time improve the state's energy economy, which now is heavily dependent upon supplies of conventional fuel located at some distance from our borders."

WASHINGTON INFLUENCE

TAX PROPOSALS given to Congress by President Kennedy include a plan for a tax credit for new investment which would be denied to electric utilities. Rejected was more rapid depreciation as an alternative. The President proposed continuing the present tax break accorded to REAs. He also wants sharp reductions in deductibility of business entertainment expenses. Next year, a comprehensive plan of tax reform is to be presented to Congress by the Administration. In the meantime, he has asked for repeal of the dividend credit and exclusion and for imposition of a 20-percent withholding on dividends and certain types of interest.

'QUODDY TIDAL POWER PROJECT has been rejected as uneconomical by the U.S.-Canadian International Commission. The group's recommendation is that nothing be done now. It concedes that harnessing the tides for power generation is "a long-range possibility," but adds that it "has better prospects for realization when other less costly energy resources available to the area are exhausted." Thermal power is now cheaper in the 'Quoddy area. Sen. Margaret Chase Smith (R., Me.) said she is "keenly disappointed" by the report. Sen. Edmund S. Muskie (D., Me.) thinks it will "require the most careful and vigorous analysis."

REA POLICY, as defined by Administrator Clapp, apparently makes it harder for investor-owned utilities to do business with co-ops. His agency is "on the record now as opposed to any power contracts which call for dual rates or any other type of limitation aimed at denying a cooperative any legitimate consumer." If a co-op can't get what Clapp calls a "fair contract," then "we are going to take a look at the possibilities of generation." REA wants co-ops' contracts with wholesale suppliers to give "adequate power" at "reasonable rates" and "to provide the necessary guarantees that these benefits cannot be withdrawn at the whim of an unfriendly supplier."

A-POWER PARTNERSHIP program, says JCAE head Holifield (D., Calif.), "has delayed the development of atomic power and allowed the privately owned utilities to dominate a program largely financed with public funds." This approach, he contends, "seems to have run its course, at least as the main vehicle for developmental plant construction... [but] it might have some merit" as a supplement to a "strong" Federal program. Holifield labelled Administration approval of the Hanford conversion as "extremely encouraging" but not enough. He suggested that after Hanford got approved and AEC's currently authorized projects were given a look-see, "I believe that AEC and the Joint Committee should have a little get-together to see where we go from here." (See p. 32 for EL&P's Washington Report.)

AEC'S DUAL ROLE in both promoting and regulating nuclear reactors is one reason for a closer look at the Commission's ruling in the PRDC safety finding, said IUE's attorney before the Supreme Court. The union also agreed with the fear of the majority of a lower court (as well as some Congressional arguments) that AEC might be influenced by the vast amount of capital invested. PRDC's brief felt economic pressure unlikely since the nonprofit organization expects just R&D—not monetary return. The U.S. Solicitor General, on behalf of AEC, pleaded for giving the agency discretion to legalize the two-step procedure it has been following. The government maintained that AEC would "require that all safety questions be answered to our complete satisfaction."

ORGANIC-COOLED A-POWER PLANT prototype proposals are sought by AEC. Proposals are due July 24, from co-ops and publicly-owned utilities. Proposed plant would have 50,000-net electrical kw and would be completed by winter 1964-65. Nine organizations have been asked to submit proposals. AEC will do the principal financing of the nuclear steam supply system, including the reactor. The utility will, at a minimum, provide the site and conventional facilities, five years of operation, and purchase of steam from the reactor.

NEW INDEMNITY AGREEMENTS with AEC eliminate the "common occurrence" gap by permitting indemnity to be applicable at the level where insurance coverage ends. Two forms are available—one for licensees who use insurance companies and another for those who use their own resources. For non-profit educational institutions, AEC is proposing another form for indemnity agreement.

ONE ATTACK ON IDENTICAL BIDDING—that of Senator Kefauver in his continuing look at the electrical equipment industry—seems to have produced little that is new except in trying to fix responsibility and blame on higher executives, rather than middle management. Kefauver has promised to turn the transcript of his hearings over to the Justice Department for further investigation.

"OBSTRUCTIONISM" is the word used by Reclamation Commission or Dominy for opposition to Burns Creek. This, he said, is the same attitude that hindered Hoover, Shasta, Grand Coulee, and even Yellowtail. Dominy told a Wyoming audience that "some of you may have been misled by a fraudulent bill of particulars put together by some segments of the private power industry—an industry which has long cried gloom and doom concerning Federal hydropower development." The Administration spokesman declared that hydro and thermal energy are not competitive and "hydropower, as part of a multipurpose resource development, is in the nation interest and has been so considered and supported by Congress throughout Reclamation history."

INDUSTRY SIFTINGS

BETTER COPY CONTEST WINNERS, announced at the PUAA Annual Convention in Detroit last month, were headed by these top performers, each with awards in four or five categories of the nationwide competition among electric and gas utilities: Pacific Gas & Electric Co. (Jim McCollum); No. States Power Co. (Dick Furber); Gulf States Utilities Co. (Jim Turner); Quebec Power Co.; Jersey Central P. & L. Co. (Joe Sherry); and Minnesota P. & L. Co.

SQUARE PANEL FLUORESCENT LAMP is "one of the most significant product innovations since General Electric introduced the fluorescent lamp in 1938," according to GE's large lamp dept. Mgr. Donald D. Scarff. GE plans to be in production with the foot-square lamp by Fall, when fixture manufacturers are expected to come to the market with new models utilizing the square panel. The lamp compresses a five-foot long arc path, is designed to be operated at either 80- or 50-watts, producing 4800- or 2900-lumens. List price is $6.95.

"FLAMELESS" PROMOTION CAMPAIGN, now nearly a year old, has more than 140 electric utilities enlisted in the nationwide effort, backed by some $20-million in national advertising by leading appliance manufacturers. Are results proving its effectiveness? EEI reports that record electric heat installations and Gold Medallion Home starts show impressive comparisons with pre-"Flameless" marketing. "Gas Pipeless Club" is the term used by the Los Angeles Dept. of Water & Power in saluting new converts to the all-electric concept. About the residential market it quotes builders as saying: "It isn't too hard to change the minds of gas-minded buyers into accepting an electric kitchen; but, it is impossible to sell a house with a gas kitchen when the prospective buyer is electric-minded."

APPLIANCE SERVICE TRAINING is under way on a "regular and frequent basis" on the Commonwealth Edison-Public Service Co. system in the Chicago area. First local course of a nationwide program for independent servicemen, it is sponsored by the Appliance Parts Jobbers Assoc. in cooperation with utility and appliance manufacturers. Factory training is brought to the servicemen, who meet in classrooms provided by the utility.

PRICE STUDIES SUPPORT our belief that "our customers were not overcharged—or "'damaged,'" contends Allis-Chalmers in a recently distributed report. It charts price indexes for condensers, steam turbine-generators and electrical equipment, compared with indexes for manpower and materials used as well as for non-electrical products, showing that the electrical industry's product prices stayed generally below the others in the period 1954-'59. "The price trends display modest price increases—certainly less than might be expected given the pressures of rising prices for manpower and materials...and less than the standards set by prices for comparably complex equipment," concludes the A-C report. (In his report to GE stockholders, Chairman Cordiner offered similar evidence, based on "an exhaustive review of over 50,000 order transactions.")

MORE PRICE CUTS on equipment for the electric utility market have been made in recent months, including these: "Substantially lower" prices on outdoor oil circuit breakers (announced as effective April 22 by Allis-Chalmers); 5-7-percent reductions on poleline hardware in A. B. Chance's Zones 1, 2 and 3.

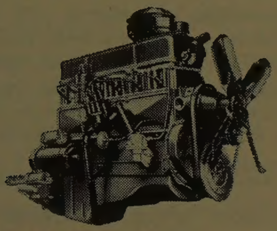
BOILER AND GENERATOR LIFE lengthened by five years on the average in the period between 1951 and 1959, a comparisonof two Ebasco studies of utility periods of 1920-'51 and 1920-1959 shows. Large-size boilers and turbo-generators in central station use had an average life of 45 and 50 years, respectively, Ebasco's John J. Reilly reported to the National Conference of Electric and Gas Utility Accountants.

ENGLISH ELECTRIC IN U.S.—Not as a newcomer, the firm notes, since "our ties with the U.S. date back to 1899 when Guglielmo Marconi arrived in New York and founded the American Marconi Co. which later became R.C.A.," but incorporated (for the first time) in the state of Delaware, the new English Electric Corporation now consolidates the U. S. activities of the English Electric Export and Trading Co., Marconi's Wireless Telegraph Co., Marconi Instruments and the English Electric Valve Co. Incorporation of the wholly-owned subsidiary here "expresses our conviction that we have a permanent place in this country's commercial and technological affairs," says the new Corporation's Pres. E. S. Dean.

"DAWN ON THE DESERT" is an impressiv 46-page "Arizona saga of people, power, progress," published by Arizona P. S. Co. to commemorate the utility's 75th anniversary. (Same milestone is saluted by Atlantic City Electric Co., also with a booklet, also an attractive one, titled "The Beginnings...and Unlimited New Beginnings.")

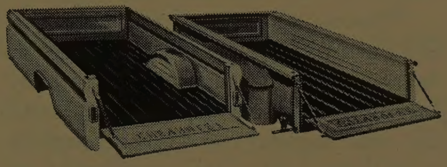
HERE'S WHY IT'S A GOOD IDEA TO GET A CHEVY PICKUP:

Because Chevy's wide choice of models (there are 15 of 'em!) means you'll get the *right* pickup . . . because each is engineered to the highest standards . . . because Chevy's rugged, smooth-riding build lasts longer, costs you less to own and keeps your profits at peak levels. Chances are, whatever you consider most important, you'll find Chevrolet has thought of it first, and done most about it. Whether you get a handsome Fleetside or handy Stepside model (or possibly a Corvair 95 Rampside or Loadside or one of a half-dozen four-wheel-drives) you'll soon be convinced that buying a Chevy pickup was the best idea you ever had!



ECONOMY

The Chevrolet slant on economy makes the most sense of all, with the tight-fisted 235-cubic-inch Thriftmaster 6 (standard) leading the way. It's the most experienced money-saver going, one that's powered more payloads than any other engine in the business. It's famous for its stingy way with a gallon of gas and also for its rock-ribbed durability. It keeps your Chevy at work, making money, instead of in the repair shop, costing. And if you prefer the extra snap of V8 power, there's the eager, efficient Trademaster V8, 160-horsepower strong and available at nominal extra cost in all conventional pickup models.



CAPACITY

Chevy pickup bodies—6½, 8 or 9 feet long—are tops in cargo capacity and convenience, with a long list of bonus-built features to keep them working better and looking their best from delivery to trade-in. Both Fleetside and Stepside models feature select wood floors for better footing and quieter going, with steel skid strips to ease loading and unloading. Extra strong grain-tight tailgates with anti-rattle latches and support chains minimize bulk cargo leakage and offer firm support for extra-long loads. Fleetside body sidewalls are double-walled in the lower section, for extra rigidity and protection of exterior surfaces against dents caused by shifting cargo.

PROFIT- ★★★★★ PROTECTING RIDE

All of Chevrolet's 2-wheel-drive pickups feature years-ahead Independent Front Suspension design, with ride, roadability and ruggedness that are paying off for truckers everywhere. The reduction in driving effort and fatigue that makes a bigger day's work come easy is just one part of the three-way Chevy payoff. The same shock-cushioning action protects your cargo against damage en route, and also protects the truck itself against the bumps that can batter the life out of cab, body and chassis components. Sounds too good? . . . sample it for yourself at your Chevy dealer's, soon! . . . Chevrolet Division of General Motors, Detroit 2, Mich.

1961 CHEVROLET STURDI-BILT TRUCKS

Commission Chairman Hoff:

Utilities Need Benefits Of Politics, Lobbying

Do exactly as you have done in the past, Stanford Hoff, chairman of the Public Service Commission of Maryland, told a recent utilities association meeting—*if* you enjoy unpopularity . . . *if* you feel it is beneath you to recognize that some people are getting elected by saying nasty things about you . . . *if* you feel that "public ownership" is no threat . . . *if* you're willing to bear the burden of collecting taxes imposed upon no other industry.

But, the commission chairman challenged, *if* these matters give you concern . . . and introspection reveals that there may possibly have been some deficiencies on the part of those responsible for guiding the destinies of your corporations, then you should take more aggressive action . . . *and start fighting back.*

The Honorable Mr. Hoff urged the Maryland-District of Columbia Utilities Association session to do these specific things:

1. Recognize more fully the benefits of closer liaison with legislators and other law-making bodies — in session and out.

2. Take an interest in politics and politicians . . . at least to the extent of seeing to it that people who know of and are sympathetic with your problems seek public office and get your encouragement and support.

Mr. Hoff asked:

Do some utility executives share the "public opinion" that lobbying is related to "dirty politics" . . . and should be avoided at any cost?

"I am afraid so," he said, adding: "If you have that attitude, you are doing yourself a disservice and missing opportunity to protect yourself from harmful legislation.

"We have two types of professional lobbyists—those who will utilize any means, fair or foul, to gain their legislative ends and, conversely, those who lobby within the strict confines of propriety, conducting themselves in a manner beyond reproach. It is this latter group that renders real assistance and advice to the legislators. These lobbyists are frequently akin to expert witnesses in a rate case, and are relied upon to furnish information in their particular fields not otherwise readily available.

"I have often wondered what monstrosities in the form of bills might be passed were it not for the advice and assistance of these lobbyists," Mr. Hoff noted.

The commission head referred to the area of politics as a matter "all of you avoid like the plague." He explained his reaction this way:

"There's not one of you that has not complained of impractical or burdensome ordinances passed by your city councils or bills approved by our legislature. You complain that these bodies are unaware of, or ignore, the problems of modern business and industry. It's frequently true that the legislators are not familiar with your difficulties—and for good reason—they're not busimen.

"You can not protect your interests by ignoring the realities of politics, nor by assuming a purely defensive attitude. And, you can not disassociate your business from politics or avoid the results of political activities by throwing coins in the wishing well.

"You're involved in politics whether you like it or not. And, you can be badly hurt by political actio adverse to the interests of your businesses. For your sake," Mr. Hof urged, "pull your heads out of the sand!"

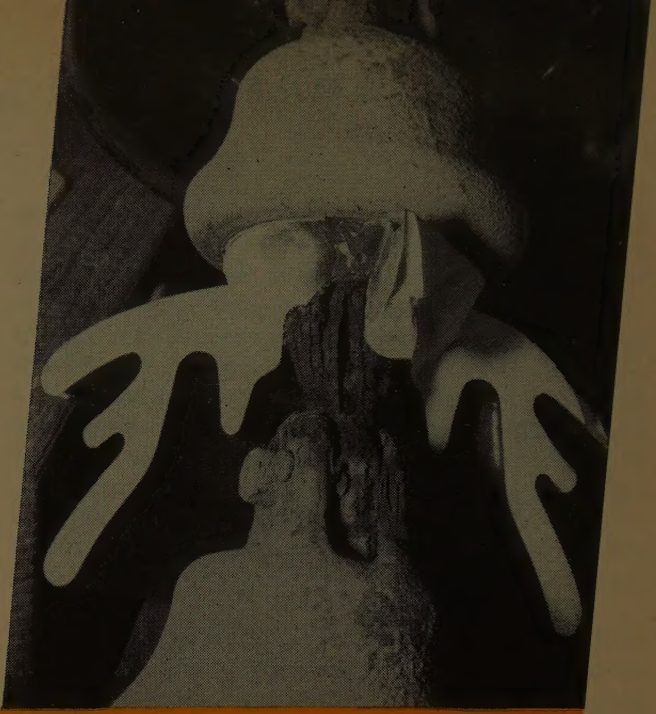
Says Chairman Stanford Hoff of the P. S. Commission of Maryland: Many people have no understanding or sympathy with any rule that prohibits a regulatory body from requiring a utility to operate at a loss. Judging by correspondence flowing into our commission, the commissioner notes, "even more remote is the idea that a utility stockholder is entitled to any consideration whatsoever."

A Glance Back . . . Then, All Eyes on the Future!

Chief executives of most of the nation's investor-owned electric companies are expected to attend the ceremony for the installation of Thomas Alva Edison in the "Hall of Fame for Great Americans," at New York University on Sunday, June 4. On the following three days, however, emphasis will be on *"tomorrow."* On the Edison Electric Institute's annual convention program, theme of which is "Targets for Tomorrow in Electric Power," are these look-ahead presentations:

Addresses by EEI Pres. Sherma R. Knapp on "Aiming for th Future," by Cleveland Electri Illuminating Co.'s Pres. Ralph M Besse on "Tomorrow's Managers," by So. California Edison's Pres J. K. Horton on "The All-Electri Future," by Maj. Gen. K. D. Nichol (former AEC general manager) o "Atomic Futures," and by Dr. E. E Schmidt (U. S. Chamber of Com merce) on "The Political and Eco nomic Climate Ahead." Researc also figures prominently.

Smogtypes need corrosion protection most!



Contaminated atmospheres are the "normal habitat" of Smogtype insulators.

It's an unhealthy environment. In areas of extremely severe contamination, even Smogtypes - - conventional Smogtypes, that is - - may not have what it takes to survive.

For a conventional Smogtype's only defense against the highly corrosive effects of contaminated atmospheres is the extra leakage distance afforded by longer porcelain petticoats. And sometimes, as the accompanying picture shows, extra leakage distance is not enough.

The Smogtype shown in the above illustration accomplished its intended purpose of protecting a 69-kv line from flashover (for a time), but it couldn't protect itself from the corrosive attacks on the pin which eventually destroyed it.

If you have to pay the 50% premium for Smogtypes in order to protect your lines from severe contamination, doesn't it make good sense to protect the *insulators themselves* from the corrosive effects of that contamination?

If contamination or corrosion is your problem, then Futura is - - or should be - - your insulator.

Why not talk it over with your O-B representative?

OHIO BRASS COMPANY, MANSFIELD, OHIO

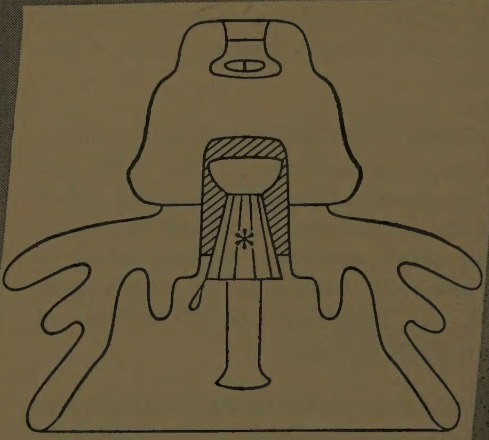
Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10083-H

extra leakage distance is no substitute for protection of C. I. S.*

*CORROSION INTERCEPTING SLEEVE



Futura Smogtype With C.I.S.*

Futura's Corrosion Intercepting Sleeve (C.I.S.) protects against corrosion in two ways. Corrosion products normally deposited on the pin above the cement line, form instead on the yieldable metal sleeve, which gives slightly to eliminate bursting forces on the porcelain. Sleeve also tends to act as a drip shield, diverting moisture (and the corrosive salts dissolved in it) from their customary destructive path down the pin shank.

NUCLEAR NEWS

CIVILIAN A-POWER PROGRAM, unlikely to be augmented through commitment of any new Federal funds this year, may receive new impetus from increased private investment—especially if one or more of several incentives are employed by the Administration to induce such support. The Atomic Industrial Forum sums up these possibilities: (1) a capital subsidy program offering government grants to private nuclear power projects, (2) guarantees to utilities to reduce their risks from unforseen circumstances (such as new safety requirements imposed after projects are begun); and (3) the lowering of the AEC price for enriched uranium reactor fuel.

NATIONAL ATOMIC POLICY, under study by a special ad hoc committee of the AIF, is expected to be defined, in terms of this industry viewpoint, by this Fall. Under the chairmanship of Atomics International's Chauncey Starr, the committee includes Bechtel's Ken Davis, GE's Lyman Fink, John Simpson of Westinghouse, AEP's Philip Sporn.

NEW AEC RESEARCH PROGRAM, adopted to keep active facilities that might otherwise have been abandoned with cancellation of the billion-dollar aircraft nuclear propulsion program, aims at development of "high temperature materials and high performance reactors." The Commission has asked for new appropriations of $25-million for the program, expects to expend nearly $20-million for it in FY-1962. Contractors most prominently involved are: General Electric, Pratt & Whitney and the Oak Ridge National Laboratory. (Meanwhile, the two firms were among seven which submitted bids to design and develop a nuclear rocket engine, in response to AEC-NASA invitation. Others: Aerojet General Corp., Rocketdyne Div. of North Amer. Aviation, Amer. Metal Products Corp., Thiokol Chem. Corp. and Westinghouse.)

REVIEW OF INTERMEDIATE DECISIONS related to licensing and compliance proceedings of the AEC are limited, following a recent Commission move aimed at expediting such procedures to consideration of: (1) important or novel questions of law, policy or administration and (2) instances in which noncompliance with the requirements or statutes of applicable rules is shown.

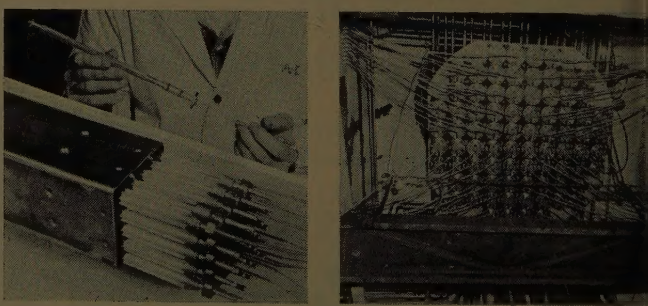
COMMITTEE ON REACTOR SAFEGUARDS (Advisory to the AEC) is to pass on unreviewed safety questions involved in license amendments proposing facility changes, the Commission has also decided in another recent alteration of its licensing regulations (10 CFR Part 50).

Neutron ionization chambers for the Enrico Fermi reactor are electrically-compensating, boron-lined monitors for detecting thermal neutrons in the range 250- 25-billion neutrons per cm^2/ sec. (Supplier is Anton Electronic Laboratories.)

VALLECITOS BWR LICENSE CONDITIONS, now calling for periodic inspections of control rods and drive mechanisms, were imposed as an aftermath of the SL-1 experience at the National Reactor Testing Station, it can be surmised. The operator, GE, is required to "promptly shutdown the reactor whenever sticking or binding of a control rod is experienced." Prior to the SL-1 accident in Idaho, some 40 instances of control rod sticking occurred, according to reports.

SURVEY OF PERSONNEL NEEDS for operating reactors, recently made by the Commission, will probably be the basis of new criteria establishing the minimum size of reactor staffs. In the power company consideration of this matter, the least familiar area is in the performance of the health physicist, and especially his relationship to the utility's established safety function. This problem will also be getting attention from the atomic plant safety subcommittee of the EEI accident prevention committee, under chairmanship of Detroit Edison's L. Clancy Nanry.

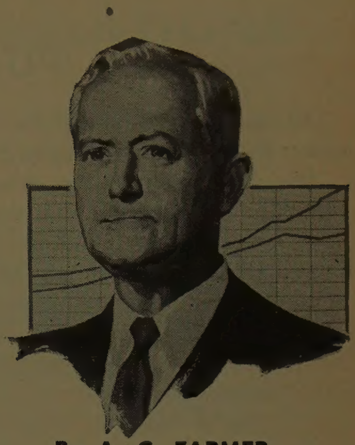
FUEL COST CURVES CROSSOVER?—When this will happen in the future is still anybody's guess. But, a survey of utility, manufacturing and scientific leaders (mentioned in a recent presentation by General Atomic's Titus G. LeClair), anticipates a rise of about 12.9-percent in fossil fuel costs and a drop of about 9.4-percent in nuclear fuel costs over the next 10 years. Mr. LeClair comments that plant efficiencies will improve in both types of powerplants, but that greater gains will be made by the atomic plants.



Finned aluminum tube of a prototype fuel assembly, for an organic-moderated reactor, shown receiving a thermocouple check (at left above) was fabricated by Alcoa using an impact extrusion technique. At right: thimble locating plate at bottom of Dresden Station reactor must line up perfectly with control rod thimbles. (Supplier is Columbus Die, Tool & Machine Co.)

ECONOMIC OUTLOOK *BY A. C. FARMER*
ECONOMIC CONSULTANT

The Problem of Employment



By A. C. FARMER

The problem of employment has become increasingly important, both politically and economically, since 1957, and in each succeeding year has been reviewed in ELECTRIC LIGHT AND POWER (July 15, 1958, October 1, 1959, and July 1, 1960).

The year 1957 is today a good point in time from which to draw comparisons, since 1957 now is the base year employed in the most recent comparisons by the government statistical agencies in the measurement of industrial and economic growth.

Since 1957, employment in the productive groups steadily has declined—in two years from 29.19-million to 28.60-million (0.59-million), and in three years from 29.19-million to 27.82-million (1.37 million).

On the other hand, employment in the service groups steadily has increased in two years from 28.82-million in 1957 to 29.98-million (1.16-million), and in three years from 28.82-million to 30.45-million (1.63-million).

These changes can be noted from inspection of the chart, noting also that since 1957 the rate of increase has been smaller in the service groups than in previous years.

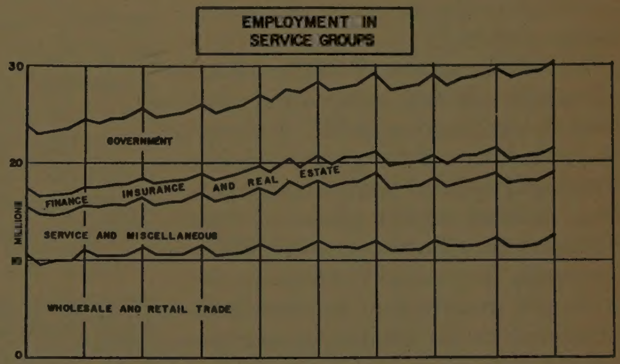
The broken line, representing the Index of Industrial Production in the chart of employment in productive groups, shows that industrial production has oscillated above and below a long-term uptrend from 1952 to 1960. The oscillations in this broken line correspond to the business setbacks experienced in 1953-54, in 1957-58, and now in 1960-61. The long-term uptrend has resulted from increased productivity per employee, the direct effect of increased mechanization, and more efficient operation in all of the productive groups.

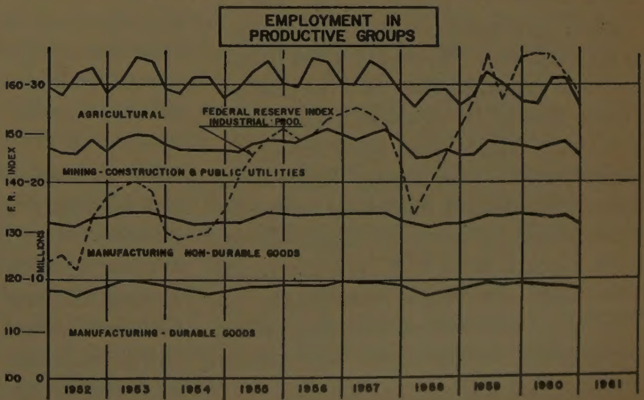
This data is of vital importance in any study designed to determine the probable trend of employment in the United States.

For example, the opinion generally seems to be accepted that the solution of the problem of providing maximum employment lies in the expansion of employment in the productive groups—particularly in the manufacture of durable goods—but the figures show that the employment in the manufacture of durable goods is only 9.06-million, and in non-durable is only 6.77-million. Obviously the solution of unemployment cannot be found by expecting the manufacturers of durable goods to absorb an estimated 5-million unemployed.

The immediate future trend of employment in America can be expected to follow existing trends—viz., a steady increase in employment in the service groups and no increase, or a possible decrease in employment in the productive groups as increased mechanization and improved efficiency of operation permit greater industrial output with the same or fewer workers.

This is the immediate future trend, but in the more distant future, expanding population can be expected once more to require an expansion of employment in the productive groups, as the saturation point is reached in the use of machinery and efficiency to increase the output per worker. Larger demand then will require both expanded manufacturing facilities and increased manpower.





In the chart, employment in manufacturing, mining, construction, transportation, public utilities, and agriculture is included under the heading "Productive Groups," while employment in wholesale and retail trade, service and miscellaneous, finance, insurance and real estate, and government is included under the heading "Service Groups."

It is startling to realize that outside of the classified Productive and Service Groups, there is a large area, including over 12-million people, whose status as employed, part-time employed, or unemployed, is in considerable doubt in the field of statistical analysis. The statements made so confidently on the total amount of unemployment necessarily are highly inaccurate, because the conclusions are based on sampling of the status of only a few thousand individuals.

Only a system requiring that an identification card be filled out for every individual from which periodic reports could be made and collected, could clarify the records of employment and unemployment.

BY RALPH ELLIOTT
WASHINGTON EDITOR

PUD's Still Stalling on Middle Snake

The latest maneuver of the Washington Public Power Supply System in the FPC proceeding involving rival applications for hydropower development on the Middle Snake River, has dissolved any possible shred of doubt that the objective of that organization in the case is delay, aimed at a stalemate that will block private development.

WPPSS, a band of Washington PUD's, is the applicant for a license to build the Nez Perce project. Throughout consolidated hearings which began last November, it has vigorously opposed as "inferior" the mutually exclusive High Mountain Sheep project proposed by Pacific Northwest Power Co.

Now, at a late stage in the proceedings, WPPSS has petitioned FPC for leave to amend its application to include, as an alternative, the High Mountain Sheep dam. This unprecedented move fits clearly into public power's pattern of action followed throughout the long Snake River development controversy: to throw up every possible roadblock against private dambuilding—regardless of its effect on the local economy and on the orderly planning to meet the area's power needs.

In 1959, when PNPC's High Mountain Sheep application had been lying inactive at FPC for over a year, the public power people were still hopeful of eventually getting federal construction of Nez Perce. In an effort to stymie PNPC's proposal, they sought legislation for a 5-year moratorium on dam construction in the Snake or its main tributaries to allow time for a "crash" program to solve fish passage problems. By early 1960 it had become obvious that the legislative effort would be fruitless. At about the same time, two additional developments — the Army Engineers' recommendation that Nez Perce be abandoned in favor of High Mountain Sheep, and FPC's announced intention to begin hearings on PNPC's proposal—drove the public ownership leaders to last resort measures. WPPSS was formed, and within a week of the date set for commencement of the PNPC hearing, filed its application for a license to build Nez Perce. It thereby accomplished a 7-month delay in getting the proceeding under way.

The sincerity of WPPSS's interest, as a license applicant, in Nez Perce has been justifiably suspect from the very beginning. That it would be impossible for that organization to develop the project under existing conditions has been obvious. In the first place the dam, being below the confluence of the Salmon River and the Snake, would block the big Columbia River fish runs that use the Salmon for spawning. As much as 15 to 20 years will be necessary to resolve the first passage problem created by Nez Perce. At least that is what the Army Engineers have twice declared within the past 14 months as a result of exhaustive studies.

Other substantial clouds over Nez Perce include the highly questionable ability of WPPSS to finance such an undertaking; also its legal ability to build the project. There is considerable doubt whether WPPSS, under its Washington State charter, has the authority to undertake such a project. Moreover, the law of Idaho specifically disqualifies a non-resident organization such as WPPSS from owning power generating facilities located wholly or partly within that state.

When the consolidated hearing reconvened in Washington, D. C. in April (following sessions in Portland, Oregon devoted to the fish problem) all of the direct and cross examination of witnesses had been completed, leaving only the presentation of rebuttal evidence. Apparently, for WPPSS the end was too near at hand, and PNPC had made too strong a case for comfort. In addition, the Army Engineers just a month before, in the second updating of their "308" report on the Columbia, had again ruled out Nez Perce because of the fish problem and recommended early construction of High Mountain Sheep. The latter would be located above the mouth of the Salmon.

With Middle Snake matters in this posture, it was not surprising that WPPSS again turned on the delay valve with its effort to become an applicant for High Mountain Sheep. If successful, the move could be the vehicle for opening up a whole new avenue of protraction in the FPC proceedings. Already it has caused a recess until June 12. And at this writing the PUD group was shaping up another delaying tool—the early filing of an application to build the Lower Canyon project on the Salmon. PNPC has clearly put on the FPC record its intention to build Lower Canyon as a component of its High Mountain Sheep plan, as soon as the development of adequate fish protection facilities will permit—and not before.

There seems to be little question, in view of what has taken place and what is in the wind, that the objective of WPPSS is a prolonged stalemate. Its theory could well be that under such circumstances Congress could be prevailed upon to approve federal development — perhaps at the Mountain Sheep or the Pleasant Valley site—as a solution. As preference customers, the PUD's would have first call on the power from such development. Meanwhile, the four utilities comprising PNPC could jolly well turn to higher cost thermal generation to meet the future needs of their preference-less customers.

It is doubtful that FPC has ever before processed a case where the good faith of an applicant was so open to question.

President Kennedy lately has been talking much about his desire to increase the efficiency of regulatory agencies; to improve and shorten procedures, prohibit undue delays, and cut the backlog of cases. His regulatory advisors, in their study of various procedural abuses in need of reform treatment, would do well to scrutinize the FPC record in the Middle Snake case.

ENGINEERING-OPERATIONS

What About This Pole-Roof Deterioration?

Whys and wherefores of roof deterioration on older standing poles are an interesting and important challenge. Here is what Pole Sprayers, Inc., Buffalo, N. Y., think about the subject:

Theories as to cause of the condition comprise a two-stage sequence. First, fungus decay and/or weathering affects the exposed top surface in such a manner as to make the surface irregular. In pine poles, for instance, it would appear that this condition is quite noticeable where the faster-growing, more vulnerable springwood rings form a pattern of regular indentation around the slower-growing (and more resistant?) summerwood growth. An easy place to observe this phenomenon is in the salvage section of pole yards.

The second stage is thought to combine continued fungus or weathering action with mechanical deterioration caused by the shrinking-swelling, freezing-thawing of moisture. "It seems reasonable to believe that this stage is accelerated by surface irregularities which allow greater amounts of moisture to accumulate," they say.

Observations indicate a " . . . much greater incidence of roof deterioration where pole roofs are overshadowed by shade trees or tall buildings. This view seems sound in that a slower moisture evaporation rate would both aid fungus growth and contribute to the secondary direct effects."

Mobile T&D Equipment Trend—Up

A growing trend by electric utilities to buy mobile substations and mobile transformers is noted by General Electric's power transformer dept. They say over 300 mobiles have been purchased by utilities from all electrical manufacturers in the past 20 years. Fifty-five percent of the total kva and 36 percent of the units have been bought in the past three years, alone.

The records also show that 55 percent of the mobile units and 65 percent of the kva shipped in the past years have been in the form of mobile transformers, rather than complete mobile substations.

The figures were released by C. A. Shelton, G. E. sales manager, following the shipment of the company's millionth kva of mobile equipment—a 15,000-kva mobile substation to Virginia Electric Power.

Mr. Shelton sees several reasons for the growing utility use of mobiles. The most important is the availability of more-and-more kva per pound in mobile equipment which has answered a need for mobiles to service larger and higher-voltage substations.

Non-metallic fan blades of unique design for cooling tower fans up to 22 ft diam. are eliminating corrosion problems. While the adjustable-pitch, tapered blades in the 16-ft diam. fans shown above are at Sinclair Refining Co. in Houston, Texas, similar blades could help corrosion at power plants. Hartzell Propeller Fan Co. bonds together and forms thin, shaped sheets of Westinghouse Micarta which is cut from material obtained in sizes that make the least waste. The material is phenolic-impregnated, fabric-base laminated plastic. The blades "are not notch conscious" like metal and can absorb vibration and other stresses far beyond those of normal service.

Blasts Faults In Less Than Two Seconds

On a recent test at American Electric Power System's Philip Sporn Plant substation, New Haven, West Virginia, General Electric two-cycle, 138-kv air-blast breakers interrupted power with line faults ranging from 9100 through 40,000 amps within a maximum clearing time of 1.8 cycles. The 1600-amp breaker was subjected to a series of close-opening tests on grounded and ungrounded faults. A total of nine faults were interrupted, ranging from 2800 mva through 9930 mva. American Electric Power and General Electric engineers cooperated on the project.

Sun Watcher Eliminates Load Estimating Guesswork

Six solar batteries inside a glass dome atop Iowa Electric Light & Power's general office building in Cedar Rapids are taking the guesswork out of load estimating. Their sun-generated power feeds a meter in the system control office. From the meter, readings are taken every hour indicating the percent of sunlight and they are recorded on machine data processing cards along with data from other area weather conditions.

Designed and built by Power and Substation Electrician Bill Godsell on the request of System Load Dispatcher Jim Young, the sun watcher has been operating for over a year.

NEW UNDERGROUND DISPATCHING CENTER RESISTS RADIOACTIVE FALLOUT

Connecticut Light & Power Company's new underground dispatching center has proved highly successful, both from functional and morale viewpoint. No employees have developed claustrophobia but morale has been improved.

By W. H. WELLS,
Dispatching Superintendent, Connecticut Light & Power Co.

The Connecticut Light and Power Company's new underground dispatching center at Southington, Conn., is one of the most unique buildings in the United States. It is designed to resist the danger of radioactive fallout in the event of nuclear warfare and is completely equipped to enable its entire staff to live comfortably for 14 days without help from the outside world.

IN REACHING a decision in 1959 to relocate our load dispatching center from the Berlin main office building to the Southington substation site, many factors had to be considered. The dispatching center had been installed at the Berlin office building when the latter was built, in order to take advantage of existing communication lines from this location to generating plants and switching substations, as well as other telephone circuits employed in gas dispatching.

As the electric system grew and more intercompany ties were added or contemplated, requirements for additional telemeter and communication circuits for dispatching increased substantially. These added intercompany ties increased power interchange problems to a point where automatic economic load dispatching equipment became necessary to obtain proper generation control for the most economical generation and to relieve the load supervisor from the drudgery of frequent telephone calls to correct generation outputs. This, in addition to the limited space for growth of the Berlin dispatching quarters, dictated that a new location was needed.

Best Site

The Southington substation is essentially the major switching hub of the CL&P Company transmission system; and this site was selected for the new load dispatching headquarters, as not only could the normal telephone circuits be readily obtained here, but emergency radio and a number of carrier telephone circuits to the major plants and switching stations were also available for backup communication. The Southington site was also more adaptable than the Berlin office for a microwave system being considered for the economic load control and telemetering system.

In view of the importance of the load dispatching center in normal as well as emergency situations—and taking into consideration that a new structure was involved, it was concluded that an underground radioactive fallout-proof structure would provide the maximum practical solution. Although the excavation costs for an underground building are greater than for a ground level structure, the use of poured concrete walls all around substantially offset the cost of a finished brick structure above ground.

It was recognized that, in case of a direct nuclear bomb hit, no building would emerge undamaged. Therefore, the design of this structure was based upon resisting the shockwave and radiation of a one-megaton bomb burst about 1½ miles away, or a 20-megaton bomb about three miles distant. According to the publication "The Effects of Nuclear Weapons," by the United States Atomic Energy Commission, the anticipated damage from such an incident would be minor and should not affect operations.

Main Building

The floor of the main building is 16 ft underground. The walls are made of 12-in. of concrete heavily reinforced. The ceiling is also made of 12 in. of heavily reinforced concrete poured on a steel deck. By using excavated soil for banking against side walls to deflect an aerial blast, it was possible to avoid a full depth excavation. The low silhouette of the main building (extending only about 18 in. above the banked soil) permits any shock wave to pass over the structure with minimum damage.

The building is entered through a small superstructure set upon the building proper (Figs. 1 and 2). This brick-faced structure, besides serving as an entrance lobby, also contains a training room with a seating capacity of 35. The training room is equipped with a chalkboard, screen and projectors. This superstructure is not an integral part of the main building. It is designed to be expendable and would be destroyed by a strong shock wave.

How Visitor Enters

The dispatching center is always locked. To gain admission a prospective visitor goes to the front door and presses a button on the intercommunication unit located to the right of the door. This sounds a single-stroke gong and lights a light on the intercom unit built into the load supervisor's telephone console. Two-way conversation establishes the visitor's identity and his business. At the same time a closed circuit television camera is focused on the visitor through the heavy glass doors. This camera is connected to a 17-in. receiver located over the meter panels in the dispatching room. If satisfied orally and visually, the supervisor operates a small switch which unlocks the door.

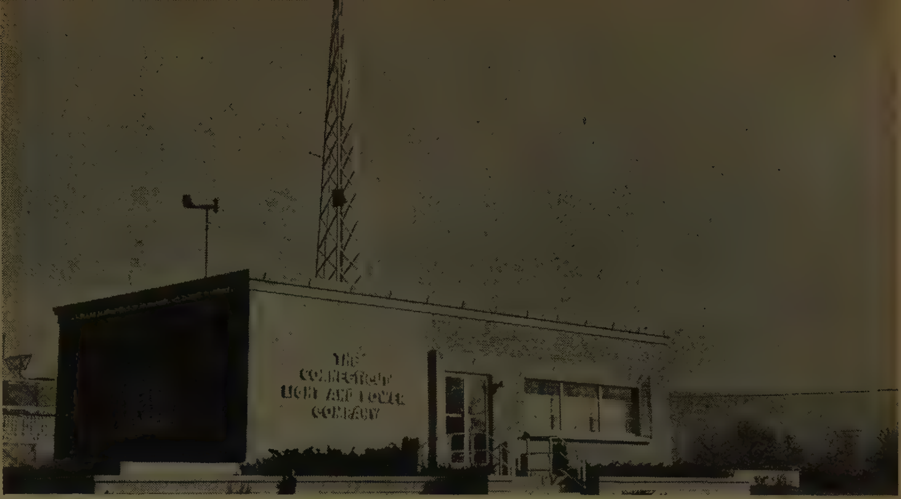
Turning left in the lobby, the visitor descends down an ell-shaped stairway to the lower level. This stairway was designed to minimize any blast effect. At the foot of the stairs is an 800-lb radiation resistant door made of ¼-in. steel plates front and rear. Space between the steel plates is filled with three in. of concrete. This is the first of two doors comprising the front air lock. There is a similar air lock at the rear entrance. These doors are kept open except during fallout conditions.

To the right of the front air lock (Fig. 1) is a hallway leading to the storage room and emergency storeroom. The latter room contains cots and sufficient food to enable the entire personnel of 17 to subsist for a minimum period of 14 days without outside contact.

Emergency Room

Just off this hallway is the emergency room. Here the cots will be set up in case of any emergency. In the far right corner hidden by an accordion door is the combined electric stove and refrigerator unit. Folding tables and chairs are permanently kept in this room. To the left of the room is the emergency escape exit consisting of a rectangular concrete shaft leading up to ground level. A steel ladder reaching to ground level is anchored to one wall. Entrance is gained through a rubber sealed door some three ft above floor level. Just inside the door are "knockout boards" sealing off the door opening. The entire exit chamber is filled to the top with dry sand. The top is sealed with a light weather capping which is flashed into the roof (Fig. 3). In case a blast should block off both front and rear stairways, the emergency exis would come into use. Removal of the "knockout boards" will allow the sand to run into the emergency room and expose the ladder. The weather cap is light enough to permit easy lifting from the ladder.

Adjacent to the emergency room is the equipment room. Located



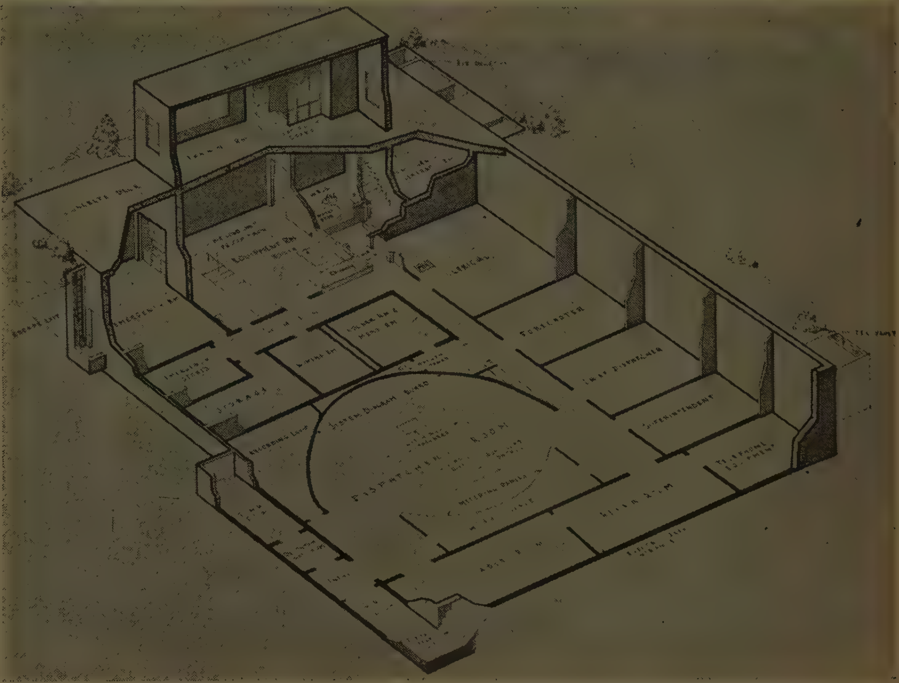
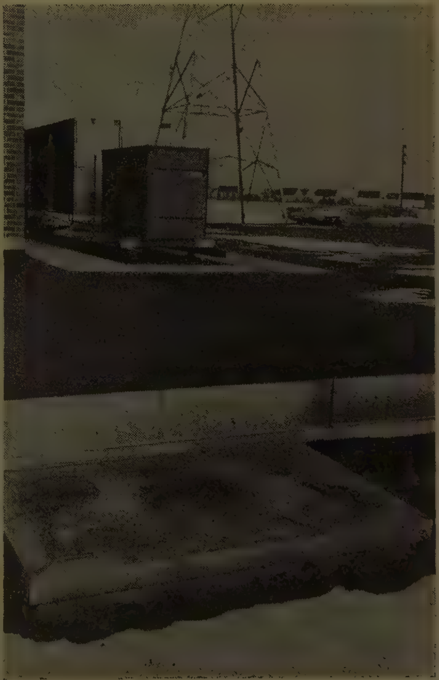
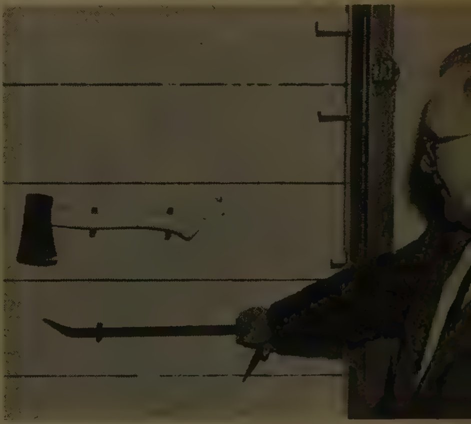


Fig. 1—Cutaway drawing of CL&P's new underground load dispatching center at Southington, Connecticut shows arrangement and location of the various rooms. Fig. 2, Top—This small superstructure is set upon the building proper which is mostly underground. It serves as an entrance lobby and also contains a training room which seats 35.





Author points to axe and pry-bar used to break away boards which hold sand around escape hatch ladder inside emergency room.

Fig. 3—Emergency exit escape hatch (foreground) is flashed into roof of main building. This exit is used, if a blast should block off both front and rear stairways. Air conditioning equipment is in background.

here are the oil-fired boiler and the air conditioning and filtration system. Ninety percent of the air is recirculated and enters the unit through louvers in the hallway wall. It then passes through a fiberglass prefilter and on through the cooling coils. From here, the air passes through the main electrostatic precipitator. The 10 percent makeup air comes from outside the building through special air inlets (front right Fig. 1), passes through an electrostatic precipitator and then merges with recirculating air just ahead of the main precipitator. Next, the air passes through another fiberglass filter and on to an activated charcoal filter. From here, a circulating fan supplies the various offices and dispatchers' room. This filtration will permit continuous use of outside air even during fallout periods. Should blast damage block off air intakes, there is sufficient cubic capacity in the building to last for several days just on recirculation. Whenever necessary, oxygen tanks located in back of the system diagram board (Fig. 1) can be bled into the building to revitalize the air supply.

Also located in the equipment room are a 10-ton and a 15-ton compressor feeding the cooling system. The entire main building operates at a controlled humidity of 40 percent.

Just off the emergency room is a 1000-gal tank fed from a deep well located under the building proper. In case of fallout, the main water supply from the city reservoir will be shut off within the building and all water requirements will be supplied by this tank and a deepwell pump. The tank is drained and refilled monthly to change the water and try out the feed pump.

Emergency Generator Room

The emergency generators are located in the right front section of the building (Fig. 1). A 10-kw a-c generator supplies the communication requirements consisting of carrier, microwave, and radio. The automatic dispatching equipment is also powered by this unit.

Emergency power for the rest of the building is supplied by a 45-kw water-cooled diesel unit generating at 208v—three phase. This is ample to care for the main building requirements. Both of these units start automatically whenever the building power supply is interrupted. An 8000-gal tank buried in the yard supplies No. 2 fuel oil for both the diesel unit and the heating boiler.

Offices

From the front air lock, a corridor runs down the right side of the building leading to the clerical office in which the PBX operator, stenographer and exchange calculator are located. Other offices are provided for the load forecaster, chief dispatcher and superintendent.

Utility Rooms

The telephone room containing all the automatic dialing and trunk line equipment is located as shown at the right rear of Fig. 1. Next comes the repair room equipped for electrical, mechanical and meter repairing. In the left hand corner of this room is the main service cubicle.

Power is supplied to this unit from two sources. The first is a 150-kva, three-phase 208-v transformer fed from the 4.8-kv bus of the adjacent Southington Substation. The second feed is from a similar transformer connected to the 14.4-kv bus of the substation.

The cable room contains the transmitters for the company radio system and also the emergency unit for communication with adjacent utilities. Here too are carrier units, microwave units and components of the electronic analog computer.

Rear Entrance

The rear entrance door has an electric lock. An intercom unit provides oral contact with the load supervisor's position. There is no television camera at the rear entrance. Beyond the entrance door

Emergency supply center contains sufficient food to enable entire personnel of 17 to subsist for a minimum of 14 days without outside contact.

Air lock doors are radiation-resistant steel filled with concrete and are set in sealed air-lock casings.

Dispatching room view shows dispatch board, consoles and Desired Generation Computer in foreground.

is the first 800-lb door of the rear air lock. This door is located at the first landing level. The second 800-lb door opens into the dispatchers' room.

Beyond the rear entry is the decontamination room with its shower equipment. Finally, there is the pump room with two sump tanks four ft in diameter by seven ft deep. One is for clean water and the other for sewerage. The clean water is pumped above ground to a settling area. The sewerage is pumped up to a septic tank connected to some 400 ft of leaching lines. Each tank cover supports two sump pumps.

Dispatching Room

The dispatching room measures 40 ft x 53½ ft. The curved aluminum system diagram board measuring 12 ft x 68 ft is painted load-dispatcher's green. In front of this board are two 508A telephone desks. The center desk is the regular switching position. The right hand desk is the emergency position while the left hand position is for future expansion. This position is currently occupied by a conventional office table and chair. A single handset is used at each of the three telephone desks (two switching and one loading). A push-to-talk button permits this handset to be used on microwave, carrier, leased lines and the two radio systems, all of which terminate in the 508A telephone turrets. All conversations at all three phone desks are recorded on a ¼-in. tape carrying five voice channels; the tape runs continuously for eight hours and then transfers to a second eight-hour tape. Built-in features permit easy play back of the tapes through a loud-speaker system. At the end of a month, tapes are erased and re-used.

In front of the meter panels is a desired generation computer which drives automatic load control equipment. Eleven steam units totalling 818 mw are under computer control. The total system generating capacity is 1032 mw gross, of which 129 mw is hydro capacity. At present, hydro units are not under computer control although provision has been made for their inclusion at a later date.

Control signals to the Montville station are via carrier equipment. Microwave is used for control signals to the Devon station and also to the Norwalk Harbor station. Additional microwave frequencies are used for telemetering and voice communication between the dispatching center and the latter two steam stations.

Communication Tower

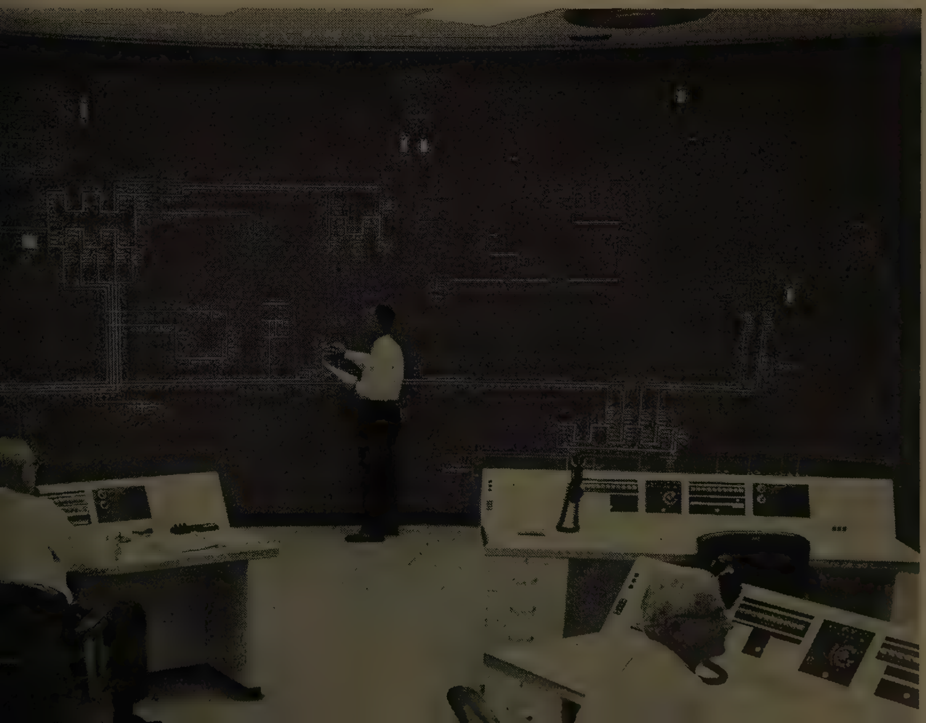
The 85-ft communication tower (Fig. 2) has at the top a ground plane antenna for the emergency radio system, linking the center with adjacent utilities. Directly below this is the six-ft diameter "dish" of the microwave unit. At the 40-ft level are two antennas—one for receiving WWV time signals and the other for the Conelrad Alert set which is built into the metering board. Just below these "whips" is an antenna for the CL&P Company radio system. This is a 456.05-mc link to a repeater station located some six miles away at a higher elevation, which permits area coverage at our assigned frequency of 37.74 mc. Further down the tower are the light cell for the light intensity meter and the geiger tube of the radiation fallout meter. Both of these meters are at the right end of the meter board. Also located on the same panel are wind velocity and wind direction meters.

Results

The dispatching center has been in operation since February 8, 1960, and results have lived up to expectations. By using high lighting levels of 200 ft-c at desk level in the dispatching room and 100-plus ft-c at desk level in all offices, we are not aware of the absence of windows. This lighting together with the air conditioning and the selection of warm colors for all rooms throughout the entire building provide very pleasing working conditions. When we decided to go underground there was some question as to how the employees would react—would any of them develop claustrophobia? It has never been mentioned.

The automatic load control equipment has removed much of the repetitive physical work from the load supervisors, leaving them more time for problem-solving duties in connection with their work. This in itself is a morale builder.

Based upon our experience to date, going underground has been highly successful both from a functional and morale standpoint.



Special meter board contains wind direction and velocity meters, light intensity and temperature recorders—also radiation fallout meter and Conelrad Alert radio.

This is a typical three-phase autotransformer installation. It is a 290/460-mva, Class FOA dual-cooled autotransformer rated 230/138-13.8 kv and located at the Bluemound Substation of Wisconsin Electric Power Company.

SAVINGS CAN BE REALIZED BY PROPER APPLICATION OF AUTOTRANSFORMERS

An autotransformer is more economical than a two- or three-winding transformer if the ratio of HV to LV is three or less.

By LEONARD R. REID, Supervisory Engineer, Transformer Department,
Allis-Chalmers Mfg. Co., Milwaukee

THE decision as to whether or not to use an autotransformer instead of a two-winding or even a three-winding transformer should be based on economics. In general, the autotransformer will be more economical if the ratio of HV to LV is three or less. There are, also, many economical applications that lie outside of this range.

Higher Voltages

High cost of right-of-way is forcing the use of higher transmission voltages to handle the increasing amounts of power. In some cases, the quantity of power and the distance it is transmitted justify higher voltages even when right-of-way costs are not too high. With the advent of higher voltages many utilities have emerged with four or more different transmission voltages on their systems.

Autotransformer Most Economical

In most cases an existing transmission-system voltage cannot be economically raised and it is general practice to connect a new high-voltage system to an existing one at several key points. These connections can best be made by autotransformers.

The choice of the autotransformer is due basically to its lower cost, higher efficiency, smaller size and lower impedance. In general, applications are 138 kv to 115 or 69 kv; 230 to 138 or 115 kv; 345 to 230, 138 or 115 kv. If the ratio of HV to LV is between 3 and 1, the autotransformer will be most economical. Outside of these limits a careful study must be made before the choice between an auto and two-winding transformer is made.

Comparison Of Transformers

A two-winding transformer, represented by the sketch shown in Fig. 1, transmits all of its energy through a magnetic core from HV to LV or vice versa.

An autotransformer (Fig. 2) transmits part of the energy through a magnetic circuit and part conductively through the series winding. The relative values of energy transmitted magnetically and conductively depend on the ratio of HV to LV. If this ratio is 1, we have no magnetic energy and, in fact, no transformer. As this ratio gets larger, the magnetic transference of energy gets larger. The size of the iron core and the amount of copper are increased as this ratio gets larger.

The size of an autotransformer, therefore, can vary from 0 to 100 percent of the size of a two-winding transformer.

Equivalent KVA

Formulas can be developed to express the size of an autotransformer in terms of an equivalent to the kva of a two-winding transformer.

Editor's Note: This is the essential text of a paper presented at the 1961 American Power Conference.

1. Autotransformer, no taps, no tertiary:

$$\text{Kva eq.} = \text{Kva}_t\,(1 - E_2/E_1)$$

2. Autotransformer ± X taps in HV, no tertiary:

$$\text{Kva eq.} = \frac{\text{Kva}_t}{2}\left[1 + \frac{100 + X}{100 - X} - \frac{E_2\,(20{,}000)}{E_1\,(100^2 - X^2)}\right] \text{ or}$$

approximately

$$\text{Kva eq.} = \text{Kva}_t\,(1 - E_2/E_1 + X/100)$$

Where:

E_2 = Low voltage
E_1 = High voltage
Kva eq. = Kva of equivalent two-winding transf.
Kva_t = Kva input = Kva output
X = % no-load taps in HV

The first formula readily shows the smaller size of an autotransformer to do the same job as the two-winding transformer. If there is 100-mva input at 230 kv and 100-mva output at 115 kv, the autotransformer will be the equivalent size of a 50-mva two-winding unit.

The second formula points out one of the possible disadvantages of an autotransformer. The addition of taps adds a factor that is independent of voltage ratio. Using the same example, if the HV is supplied with ± 10-percent no-load taps the equivalent kva becomes 60 mva, which is an increase of 20 percent; whereas, if these taps are added to one of the windings of a comparable two-winding transformer, the increase is 10 percent. The use of taps in an autotransformer must be carefully considered, as they may increase cost considerably.

Avoid LV Taps

Taps in the LV winding should be avoided if possible. Since any tap in the LV also affects the HV, it is necessary to compensate the HV with additional taps. In general, taps in the LV winding of an autotransformer are twice as expensive as taps in the HV winding.

Three single-phase autotransformers rated 120/160/200-mva, OAB/FA/FA 345-320 kv installed on the Bonneville Power Administration System.

Tertiary Winding

Since an autotransformer must be connected Y-Y, it is generally necessary to add a delta tertiary winding. HV autotransformers should have their neutrals grounded for stabilizing the neutral, and, also, for insulation reasons. In shell-form transformers, a delta tertiary provides a reasonable zero-sequence impedance. A three-phase core-form unit may have a low enough zero-sequence impedance to provide sufficient current for line-to-ground fault relaying.

The main reason for a delta tertiary, however, is to suppress third harmonics. This is true for all forms of transformers. The third harmonic current or voltage may cause telephone interference. It is the author's opinion that a delta-connected winding is required on any transformer unless there is a Y-delta transformer of equal kva size in the station and with both neutrals connected solidly to allow third harmonic currents to flow between the units.

It has been general practice to make the tertiary 35 percent of the size of either the common or series winding. This, however, may not

TABLE I

COMPARISON OF DESIGN CHARACTERISTICS
FOR
TWO-WINDING TRANSFORMER VS AUTOTRANSFORMER

	Two-Winding	Autotransformer	
	Transformer	Series Transformer	HV - LTC
Initial Cost %	100	73	68
Core Loss (Kw)	100.0	100.0	100.0
Total Loss (Kv)	530.0	420.0	378.0
IZ H to L%	14.5	7.25	7.25
Regulation .8 pf %	9.6	4.8	4.6
Total Weight #	360,000	300,000	271,000
Floor Space (ft)	28′ x 17′	26′ x 15′	22′ x 17′

Note: Examples used for comparisons are 100-mva transformers, 138 to 69 kv, ± 10% LTC.

be necessary. If the impedance between either the HV or LV and the TV (tertiary-voltage winding) is sufficiently high to protect the TV, there is no valid reason for a 35-percent tertiary. In most cases a 10-percent TV will be of ample capacity to handle any short-circuit.

Two percent is ample to carry the harmonic current. The impedance of the TV to LV or HV has little relation to its ability to suppress harmonics to the outside circuits. The position of the delta tertiary winding relative to the iron core has a large effect on the protection of outside circuits from triple harmonics. Formulas can be developed the same as 1 and 2 with the tertiary-winding effect incorporated.

3. Autotransformer, no taps, 10-percent tertiary:

$$\text{Kva eq.} = 1.05\ \text{Kva}_t\ (1 - E_2/E_1)$$

A tertiary only adds 5 percent to the size of the autotransformer.

4. Autotransformer, ± X percent taps HV, 10-percent tertiary:

$$\text{Kva eq.} = 1.05\ \text{Kva}_t\ \left(1 - \frac{E_2}{E_1}\right) + \frac{1.1\ (X)\ \text{Kva}_t}{100}\ \text{(Approx.)}$$

Kva addition for taps is 10-percent higher than unit without tertiary.

Limitations of Autotransformers

A little care must be used in applying the above formulas to determine savings in an autotransformer.

If the difference between the HV-minimum tap and the LV line is less than 20 percent of the HV there is an insulating problem. During lightning impulses a high voltage develops across the series winding. With less than 20-percent turns, it may be very expensive to insulate the winding turn-to-turn or coil-to-coil. Lightning arresters generally are required from HV to LV when series turns are less than 20%.

Taps in the HV can cause insulation and mechanical problems. If the series winding is 30 percent and taps of 10 percent are taken out, it means that one-third of the series winding may be in-or-out of the circuit. This requires more insulation to stand various voltage surges. The required special design will make cost greater than indicated by above formulas.

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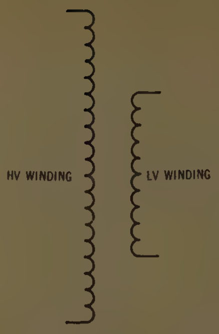


FIG. 1

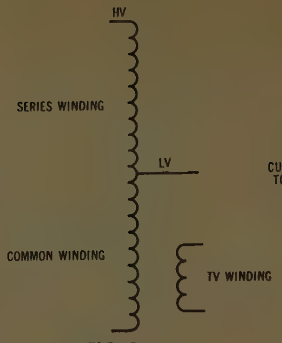


FIG. 2

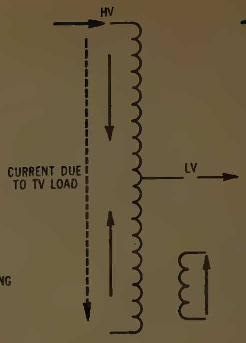


FIG. 3

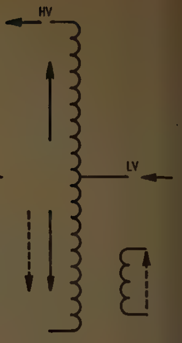


FIG. 4

Fig. 1—This is a sketch representing the winding of an ordinary two-winding transformer.

Fig. 2—Sketch representing the windings of an autotransformer with a tertiary (TV) winding.

Fig. 3—This shows the direction of current flow in a step-down autotransformer with a load on the TV winding. Fig. 4—Illustration of the current flow in a step-up autotransformer with a load on the TV winding.

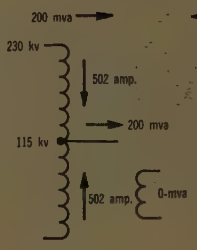


FIG. 5

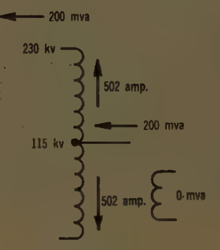


FIG. 6

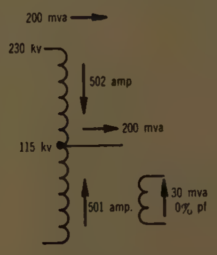


FIG. 7

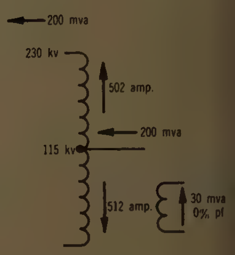


FIG. 8

Fig. 5—This represents the current flow in a 200-mva step-up autotransformer with zero load on the tertiary.

Fig. 6—This illustrates the current flow in the 200-mva autotransformer used as a step-down transformer with zero load on the tertiary.

Fig. 7—Illustration of the current flow in the 200-mva, step-down autotransformer with a 30-mva, zero-percent power factor, capacitive load on the tertiary and a lagging load of 200-mva at 99-percent PF on the LV. Fig. 8—Effect at the same TV load as Fig. 7 when used as a step-up autotransformer.

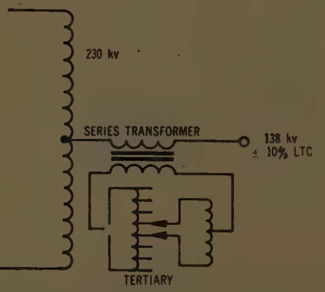


FIG. 9

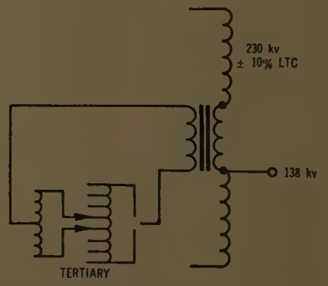


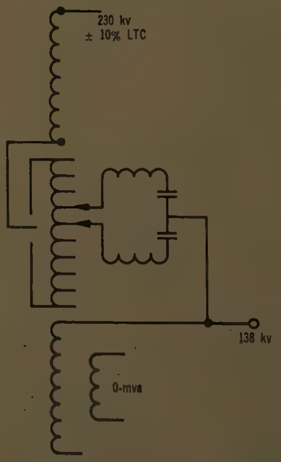
FIG. 10

Fig. 9—The usual connection for installing load tap changing on autotransformers.

Fig. 10—This shows the application of a load tap changer in the HV winding.

FIG. 11

Fig. 11—An autotransformer with a HV-LTC mechanism installed directly in the line end of the transformer.



WATCH PHASE DESIGNATION IN LOOP CIRCUITS

When phase is designated in looped three-phase circuits, care should be taken to choose the least confusing method.

By **VICTOR A. KINITSKY**, Visiting Associate Professor of Electrical Engineering, Purdue University

THE "STANDARD" METHOD of phase designation can lead to confusion and its application should be avoided in cases involving loops in three-phase circuits.

According to ASA Standards[1], terminal markings of transformer windings wound on the same core have the same subscripts. The standard displacement angle between high and low voltages is 30 degrees for three-phase transformers with wye-delta or delta-wye connections. The phases of two systems interconnected through wye-delta or delta-wye transformers can be designated arbitrarily, thus providing the desired displacement angle between two systems. However, once the phase designation is established for the system it should not be changed.

Three Conventions Exist

There are three conventions in use for phase designation of two systems interconnected through wye-delta or delta-wye transformers:

1) "Standard" Method. Phases connected to transformer windings wound on the same core have the same phase marking, i.e., the displacement angle between two systems is ± 30 degrees.

2) Symmetrical Method. Phase A on the wye-connected side of a transformer is linked magnetically with phase winding BC on the delta-connected side; likewise, phases B and C on the wye-connected side are linked magnetically with phases CA and AB on the delta-connected side respectively. Phase shift in wye-delta or delta-wye transformers is 90 degrees backwards depending upon the manner of winding connection.[2]

3) Uniform System. Phase shift is also 90 degrees as in the Symmetrical Method, but subscripts 2, 3 and 4 are provided for the phase displacement 90 degrees backwards, 180 degrees and 90 degrees forwards respectively.[3]

The first convention is very often used in electrical installations. However, its application in cases involving loops can lead to confusion. Such confusion has occurred on the system shown in Fig. 1. Initially, the installation consisted of 4.16-kv and 33-kv systems connected through wye-wye transformers with a phase shift of 180 degrees. Then an installation of 13.8 kv was added with delta-wye transformers, the phases of which were designated in accordance with the first convention. Later a 66-kv system was connected to the 13.8-kv bus through delta-wye transformers designated according to the first convention. Total phase shift is 120 degrees.

Therefore, starting from phase A on 4.16-kv bus around the loop in the counter clockwise direction we will come back to phase C; starting

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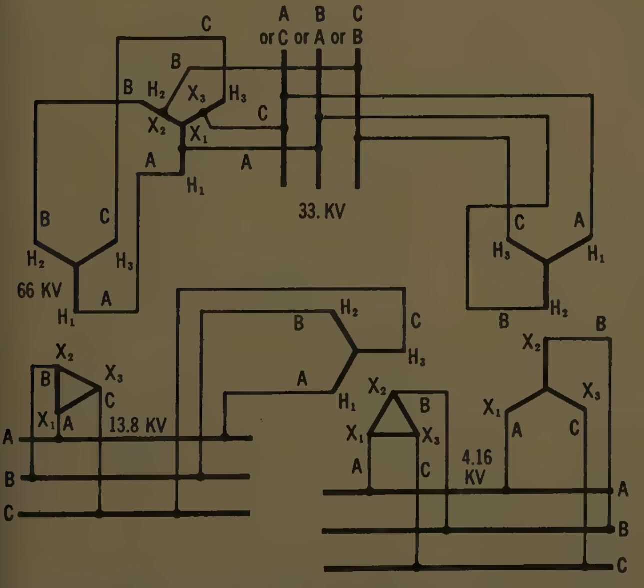
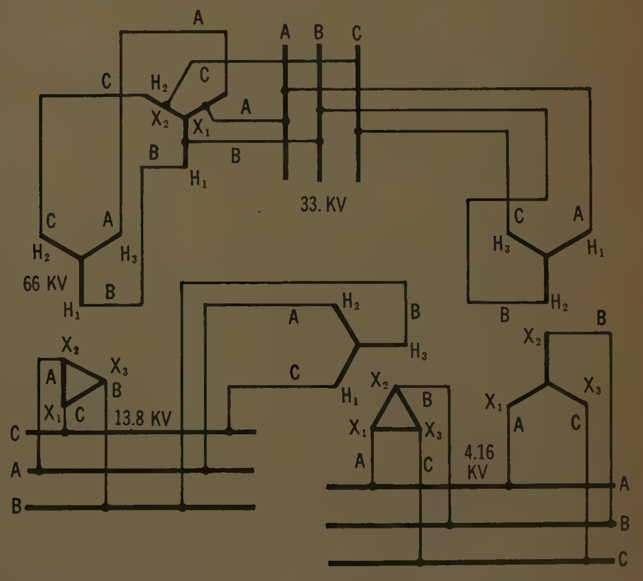


Fig. 1—"Standard" method of phase designation gives the following result. Going in the counter clockwise direction starting from 4.16-kv bus the shifts in the transformers are: 1) 4.16-33-kv transformer, 180 degrees; 2) 33-66-kv autotransformer, 0 degrees; 3) 66-13.8-kv transformer, —30 degrees; and 13.8-4.16-kv transformer —30 degrees.



Total shift is 120 degrees. Fig. 2—Shifts in the transformers are as follows going counter clockwise: 1) 4.16-33-kv transformer, 180 degrees; 2) 33-66-kv autotransformer, 0 degrees; 3) 66-13.8-kv transformer, 90 degrees; and 4) 13.8-4.16-kv transformer, 90 degrees. Total phase shift is 360 degrees.

Imperative That We Stay Financially Sound, Green Tells MVEA Engineers

While the future outlook for revenues is bright, said Richard C. Green, MVEA president and president of Missouri Public Service Company, meeting our growth responsibilities will depend upon keeping financially sound, keeping expenses in line, spending wisely, and earning an adequate income. His was the opening address of the general session of the 32nd Annual Engineering Conference of the Missouri Valley Electric Association, held in Kansas City last month and attended by some 700 delegates of member companies.

Attitudes of regulatory bodies will play a major part in our financial future, said Green, because rate making policies will affect our financial soundness. Utilities will be at a disadvantage unless rates are determined on fair evaluation; returns must be in line with unregulated industries to keep up with inflation and to attract investors, he concluded.

Engineers should not try to cover up deficiencies with charm, John Gammell, Allis-Chalmers' director of professional development, told conferees. Work for technical competence through continuing education, he advised; join your professional societies, learn the ethics of your profession, and establish your professional identity. Continue selective reading to broaden knowledge; find the right job and then grow in it.

We are all content to live in a world run by lawyers and politicians, continued Gammell. But, the destiny of any nation depends upon the opinions of young men, and it is a shame that engineers and scientists, who otherwise play such a major role, have no interest in public affairs. Conduct your own self analysis, he urged, and establish goals, for, if you don't have a dream you can never make a dream come true.

Technical Sessions

W. J. Googe, Paul Harris, and R. L. Watt, Southwestern Electric Power Company, collaborated on a paper comparing different kinds of bus arrangements for substations operating at 138 kv. In general, the authors conclude that the main bus-transfer bus arrangement is least expensive but impractical when the system cannot afford to lose all generating units and lines connected to the bus. The ring bus type station is only slightly more expensive and is adequate where lines have operating records of not more than three operations per 100 miles per year. Minor advantages of other type stations, they conclude, do not justify added investment.

Rates must be determined on fair valuation if we are to remain financially sound, R. C. Green, MVEA president, tells delegates to the 32nd annual engineering conference.

KG&E, according to D. W. Palmer, has reduced substation structures and component parts to the least common denominator by maintaining control of its own designs and keeping full deadend tensions off of structures. All columns, trusses and other components of 1961 structures, he said, are interchangeable with those erected in 1929. Two standards, one for 69 kv and one for 12 kv and below, have taken care of all structural needs until recently when a new standard was added for 138 kv. One column and three trusses make up the 69-kv stations, and only one standard column is required for stations up to 12 kv.

R. H. Lambert, Allis-Chalmers, reporting the first year's field experience with static overcurrent relays, said the problems normally anticipated with a new product had been overcome and would lead to design improvements. Reduced maintenance, greater flexibility, immunity to shock and contamination are characteristics promising a bright future for relays without moving parts, he predicted.

Discussing problems associated with substation loads, Clark Denison, Oklahoma Gas & Electric Company, suggested obtaining accurate knowledge of load characteristics such as quantities, diversities, temperature and time variables, etc., through adequate metering. Economical and dependable service at acceptable voltages can only be supplied when full knowledge of load characteristics permits proper voltage regulation and power factor correction, he said.

Foreign Systems

J. F. Gaston, Iowa Electric Light & Power Company, related problems encountered in railway right-of-way crossings which led to his company's refusal to sign standard agreements. In the standard agreement, he said, the railway attempts to indemnify itself against its own negligence and that of its employees. Lack of permanence and the nuisance of fluctuating annual fees (recently increasing) are other objections to standard agreements. Railroad property can be condemned like any other property, he observed, as long as proposed use is consistent with railroad use. Further, he added, railroads cannot erect a "Chinese Wall" over which a utility cannot pass.

Creation of a sprawling freeway system within an urban complex requires a lot of coordination and understanding between state and local authorities, according to Kenneth P. Chase, Kansas City Power and Light Company. Design of lighting and signal systems by the state affects maintenance and energy costs which are borne by local people. Control and maintenance of systems after construction, and many other serious problems must be agreed upon during early planning, he said. Use of several brands of signals and lamps complicates the maintenance picture, adding numerous spare parts and records to warehouse operations.

E. W. Glancy, AT&T engineer, discussed common problems of clearances on joint-use poles as affected by the Sixth Edition of the National Electrical Safety Code. While the new code is a compromise, he said, it will probably result in significant savings to both power and telephone industries without sacrificing safety.

Meter Committee

John Holtzclaw, OG&E, described his company's methods of testing instrument transformers which ultimately led to retirement of all units not within the 0.3-percent accuracy class. While the Class 200 meter has reduced the need for many small current transformers, he said, increase in capacity requirements of many customers continues to require installation of more instrument transformers. To keep pace, OG&E, he reported, has adopted the burden method of field testing, which is proving to be a simple, non-technical, and economical means of assuring performance and accuracy.

E. J. Allen and E. W. Feuerstein, General Electric Company, collaborated in preparation of a timely paper which discussed lightning arrester application, location, and service problems peculiar to the protection of metering equipment used on 12-kv distribution circuits. They enumerated points for consideration that would assure optimum protection from lightning damage to primary metering equipment.

Discussing economics of primary vs. secondary metering of loads, W. M. Heusinkveld, Iowa Southern Utilities Company, said that secondary metering tends to favor the utility only if load factor is good. Although annual cost of primary metering of customer demands under 150 kva is prohibitive, he continued, demands to 1000 kva should be metered on the secondary if normal load factor is expected. In the interests of accuracy, and because cost of metering is not significant, demands above 1000 kva should be metered on the primary side, he suggested.

A continuing check of his system's kilovar requirements to keep abreast of constantly varying load conditions, was reported by E. E. Ertel, Arkansas-Missouri Power Company. Greatest benefit of fixed capacitors, he said, lies in proper application of secondary capacitors. However, he added, recent reduction in prices of primary units calls for a reappraisal of the values of primary and secondary applications.

If you don't have a dream, you can never make a dream come true, John Gammell, Allis-Chalmers, advises MVEA engineers.

Hermetically-sealed watthour meters will someday be available, according to R. L. Dunning, Westinghouse Electric Corporation, but many changes will have to be made in operating procedures and practices as well as regulations before utilities will be ready to accept them. If we are ever to have them, he suggested, advantages and disadvantages, methods of hermetic sealing, inherent design and manufacturing problems, and required changes in practices and procedures should be considered now.

Overhead Systems

F. P. Tierney, Northern States Power Company, pointed to low incidence (3 to 6%) of ground line decay in some 13,000 butt-treated cedar poles, on the company's system from 20 to 35 years, as evidence to support the importance of exercising extreme care in purchasing and initial inspections. Experience with ground line treatment studies concluded that such treatments might well furnish added protection against infection from without but that none of the types of treatments tested could be expected to arrest heartwood decay. High retention of original preservative in treated butts of most cedar poles, and excellent condition of them, resulted in deferring action until another survey in five years. Because the subject is a technical one, said Tierney, it should be treated like one, with a wood technologist or chemist on the staff.

Peak primary loss in 1960 on the Union Electric system would have been reduced by 5300 kw had primary conductors been installed the year before in accordance with economic sizing, F. F. Gray told conferees. Annual savings from this reduction would be in the order of $235,000, he said, and other advantages would be realized in the form of improved voltage regulation, increased ability to handle load diversions under emergency conditions, and reduction of stock.

Discussing the CSP vs. Conventional transformer controversy, H. G. Hally, Iowa Power & Light Company, said lower installed first cost and advantages of factory assembly and adjustment seem to favor the CSP. However, he added, the conventional unit allows the utility to chart its own course, varying its loading practices by controlling size of the primary fuse. Which one you use, after evaluating all factors, he concluded, depends on how you want to operate.

M. W. Gangel and R. C. Ender, General Electric Company, presented a digital computer program for dynamic planning of distribution systems based on growth and change. New concepts were introduced, according to the authors, to provide a more realistic system representation . . . dimension of time with associated features of load growth, system development and present worth economics; relationship of load factor, loss factor, and responsibility factor to diversified demand; variation of peak load power factor as a function of customer group size; use of capacitors as a basic design tool rather than only an economical supplement; etc.

L. M. Rumph and R. V. McCalmont, KG&E, described their company's new 138-kv bundled conductor transmission line program to bring 750 mw into Wichita from the new Gordon Evans station. Oil circuit breaker availability, distances involved, and right-of-way considerations contributed to final decisions to expand the 138-kv system rather than go to EHV. Two 666.6 mcm ACSR conductors per phase were used in preference to 2000 mcm all-aluminum conductor, providing a reduction in reactance of about 25 percent, according to the speakers.

Power Systems

Attractive economics of EHV transmission is making it a more important factor in power system expansion plans of many utilities, according to D. F. Shankle, Westinghouse Electric Corporation. Continued research of lightning and switching surge phenomena leading to more reliable systems and reduced costs will make EHV even more attractive, he predicted. Investigations underway and completed in the field of EHV transmission, he concluded, will enable the industry to economically handle power transmission requirements forseeable in the next ten to 20 years.

Enumerating benefits of automatic control, W. E. Korsan, Allis-Chalmers, described conversion of Gulf State's manually-operated Riverside plant to automatic control on a daily cycle for peaking service. Conversion of an old plant, he said, is more difficult and many functions which could be economically provided in initial plant design are quite expensive to add. Because such a control system raises capital cost, increase that can be justified will determine the common-sense degree of automatic control used.

Prime Movers

Engineering studies indicate that the gas turbine can be combined with the steam turbine to provide high capacity, high economy generating units at costs comparable to reheat units of similar size and cycle, according to J. Bruce Stout, OG&E. The combined cycle, he said, is expected to provide normal operating flexibility in a load range between quarter and full capability with fuel economies that are improvements over the conventional similar reheat cycle; however, some details such as automatic control are still to be resolved.

Describing recent developments in utility boiler design, E. G. Kispert, The Babcock & Wilcox Company, observed that high cost of money, labor, fuel, and equipment dictates a minimum of reserve equipment while maintaining availability and efficiency at highest levels economically feasible.

Don Hunt, left, Iowa Electric Light & Power Co., and Ralph Thornton, Oklahoma Gas and Electric Co., serve as vice general chairman and general chairman, respectively, of the MVEA Engineering Conference.

Underground

Yale Goldberg, Iowa Power and Light Company, described conversion of the Des Moines underground system from 4 kv to 13 kv to keep pace with load growth and reliability requirements of the downtown area. All 4 kv equipment was salvaged, he said, to replace undersized banks and protectors on the 4-kv system remaining after conversion.

Design and construction details of underground vaults used on the Oklahoma Gas and Electric Company system were described by R. L. Matthews. Floors and walls are now redesigned for one thickness for both street and non-street vaults, he said, and vault roofs are completely removable. Whenever convenient, a small bus is added to vaults so that they also function as service manholes. Size permits access on all sides of a 750-kva transformer for inspection and minor maintenance without removal.

R. B. Friedrich, Kansas City Power & Light Company, described installation of two miles of 161-kv pipe-type cable to supply a 13.2-kv substation where overhead lines were virtually impossible, and also installation of a 115-kv high-pressure gas-filled cable connecting a generating station to a substation 1800 ft away.

Sufficient field experience now exists with epoxy-orlon kits to permit successful use of potheadless terminations in a number of applications up to and including 15-kv service, according to Kris Neville, The Epoxylite Corporation. A substantial saving results, he said, but users are cautioned to adhere to proven applications and to follow instructions implicitly.

Advent of pad-mounted transformers for residential underground distribution in 1958, according to W. K. Smith, Union Electric Company, led to development of an entirely new company concept for supplying this type of service. System adopted is a primary loop system consisting of a single-phase cable connected to the same phase of an overhead supply through a fused disconnect switch on terminal poles at each end of the cable. The cable is connected through disconnect switches to a bus at each transformer which is then energized through a primary fuse disconnect. One of the switches is left open at the center transformer in the loop so that half the transformers are supplied from each end of the circuit. Transformers are protected by primary bayonet type disconnect fuses; secondary breakers clear secondary faults. All cables are direct buried at depths that do not require covering or protection. Primary and secondary cables are installed in the same trench with 12-in. vertical and horizontal separation, according to Smith.

NELPA Speakers Place Primary Emphasis On Today's Unprecedented Challenges

At no time in history has mankind itself and the electric light and power industry been faced with more compelling problems than beset us today. Such was the consensus of the principal speakers at the Northwest Electric Light & Power Association's Spring Conference in Portland, Oregon.

This joint conference of the Engineering and Operation Section, the Personnel and Safety Section, and the Purchasing Committee, drew a record attendance of approximately 650 delegates and their wives.

"Are We Smart Enough To Survive" was the challenge thrown out by John R. Howard, president of Lewis and Clark College, in his address at the opening general session. "The predicament of a chameleon on a piece of Scotch plaid is nothing compared with a modern man being told to adapt to a situation so violently and rapidly deteriorating," he declared.

Emphasizing that change is the compelling feature of our age, Mr. Howard said "New sources of energy have completely redefined our world. We have no language or habits of policy adequate to cope with this new power.

"We need men who are not adjusted to and who are not satisfied with our present situation: men who find their greatest thrills in big challenges to overcome.

"We cannot afford to be or to cultivate mass men, replaceable units in a social system designed mainly to produce and consume things."

In a companion address, Wm. Ismay, industrial relations director, Arizona Public Service Co., made the important point that man must have faith in all things; and that he must dare to dream.

"We are too prone to be satisfied with things as they are," he declared. "Beaten paths are for beaten men."

Admonitions advanced by Olin H. Ririe, NELPA vice president and assistant to president, Utah Power & Light Co., warned his utility listeners that they must make time and money count; must lead in methods; must do a better job of understanding people; must foster employee loyalty; must rededicate themselves to the importance of the customer; must work for free enterprise; and must continue to be circumspect.

"The quality of personnel relations prevailing in any organization and the level of employee morale and loyalty is not a matter of chance," declared C. Herald Campbell, personnel director, Pacific Power & Light Co. "It is profoundly influenced," he said, "by a simple and relatively informal organization structure which not only permits but enforces the maximum of informal face-to-face relationships and keeps impersonal institutionalized relationships at a minimum. This type of structure likewise provides a high degree of freedom on the job, utilizes a larger measure of the individual's capacities, requires the exercise of personal judgment and initiative, and encourages the development of native abilities."

L. S. Horton, electrical engineer, California Oregon Power Co., reported the findings from a questionnaire survey directed to seven NELPA member companies and one Eastern utility in an effort to determine accepted policies with respect to duplicate feeds to distribution substations. It was found that each company has its own individual policy, which is determined by necessity, precedent, economics, outages, size of station, importance, and several other features. System planning in which the relative value of each of the criteria is carefully weighed with respect to cost, benefits, risk, and policy seem to be the most realistic approach.

A panel discussion during a Purchasing and Stores Committee session brought out a number of pertinent points, to wit:

(a) The longer an equipment item lasts the cheaper it is to the utility.

(b) Concern is felt about quality in this depressed market.

(c) Money costs the utility too much for it to do advance buying to take advantage of low prices.

(d) Some projects are still in a formative stage when bids are requested; thus alternates help in reaching decisions.

(e) Manufacturer's research and development efforts do have a bearing on allocation of business; it is both a purchasing and a management prerogative.

(f) Group meetings of engineering, operations, and purchasing representatives are held often.

(g) In at least one instance, complete proposals, including prices, are forwarded by purchasing department for analysis and recommendations as to purchase.

(h) Supplier contributions to installation of equipment through field service engineers has an important bearing on buying decisions.

SEE Engineers Told Of Important Responsibilities

Utility engineers must examine their designs and practices in the light of today's conditions and take time to think through and adopt improvements which will result in economies and improve service. This was the message of O. J. Miller, executive vice president of Duke Power Company and president of the Southeastern Electric Exchange, in addressing the SEE Engineering and Operation Section Conference held in Hollywood, Florida, last month.

Miller said that utilities must also know all about the generation of electricity directly from the new energy sources and adopt them as opportunity presents itself. "We must so conduct ourselves that our customer feels that we are doing all of this for his benefit," he asserted.

Morehead Wright, General Electric Co., in discussing how people grow in a business organization, said that the development of people cannot be based upon any set of ideal or specified "personality characteristics or traits." A man's development is 90% the result of his experience in his day-to-day work, he declared. One of the principal findings of General Electric's research project on this subject was that much more research is needed before "we even begin to know an appreciable part of the many factors involved," Wright said.

The new simulation technique in system planning assures consistency in service standard for various patterns being evaluated and has the advantage of being able to include explicitly many more of the variables than heretofore possible, declared J. K. Dillard, Westinghouse Electric Corp. The importance of these variables can be evaluated and simplifications may be proved rather than postulated. Simulation also offers speed and realism, Dillard said.

Distribution

In discussing the possibilities and status of higher secondary voltage as a distribution system to serve total electric homes, Robert F. Lawrence, Westinghouse Electric Corp., said that it would result in distribution system cost savings for the utility. The developer and user would also benefit from the lower cost of the 240/480-v service in the case of underground distribution. "Incentives to spend the present dollars to save future dollars are not well placed in the scheme of things to obtain strong motivations to make higher secondary voltage become a national reality," Lawrence concluded.

There is little advantage in providing two buckets on an aerial bucket truck, according to the results of a recent study by West Penn Power Co., reported E. J. De Chambeau. Too often, the second man is not in the proper position to help. For many jobs a 2-man crew is ideal. These include installing transformers, changing deadends, insulators, transferring and removing poles in non-congested areas, reinsulating or revamping lines, etc. A 3-man crew is most productive when framing and setting poles or handling poles in congested areas, De Chambeau stated.

According to A. C. Brown, Virginia Electric and Power Co., the best method yet devised to correct insipient troubles is to try out any new scheme on a limited basis, get the bugs out and then use the experience gathered to promote the new idea system-wide. In this way, Vepco's Method Supervisors often get at troubles before they occur, and make corrective measures that save time and materials and costly mistakes, he said.

When installing additional shunt capacitors, fundamentals and past experiences should be remembered and be on the lookout for new problems. This was the warning of John W. Hunter, Carolina Power & Light Co. He said that none of the problems encountered over a 15-year period would preclude the use of shunt capacitors on feeders.

Transmission

A point to point overhead d-c transmission line must be at least 400 to 500 miles long in order to have the cost savings in the line pay for the higher terminal costs, declared R. P. Johnston, Allis-Chalmers Mfg. Co. This would still not result in any savings over a-c transmission, but would simply make the two comparable in cost, he said.

In describing the effectiveness of Virginia Electric and Power Company's maintenance practices on high voltage circuit breakers, E. L. Mackay said that maintenance cost per $1000 of plant investment has declined from $28 in 1945 to $8 in 1960, whereas plant investment had risen from $4.6 million to $24.5 million in the same period. Vepco feels that all breaker maintenance should be preventive maintenance and not the repair of damaged equipment, MacKay declared.

Herman J. Troche, Holan Corp., described the hot line work techniques of American Electric Power Corp. with metal lined baskets. He said that a repair sleeve was installed on a damaged conductor in a 138-kv line by this new method in .75 man-hour with no interruption in service, whereas 30 man hours was required for the conventional method with the line out of service.

Production

Power plant preparations for hurricanes at Florida Power & Light Co. pay dividends in preventing damage to property and maintaining equipment in service, according to J. R. Bensen. It is very important that the inspection and operating crews be assigned in rotating shifts and made to rest when off duty to insure that crews are rested and alert.

The use of stainless steel for various components has solved many of the corrosion problems of horizontal turbines on the Duke Power Co. system, declared John H. Tibbs. He described the cylindrical rotating trash racks used by Duke to keep the forebay areas in front of the rack clear and have also increased unit operating time and reduced trash handling costs.

Based on a comprehensive evaluation program, low-frequency, high-potential testing will stress a turbine generator winding in the same manner as does a power frequency overvoltage test, in the opinion of C. D. Richardson and W. J. Gilson, General Electric Co. It does this with relatively small equipment which is convenient to transport. The same voltage between 0.1 cps and 60 cps will establish the same confidence when used in service testing, they asserted.

L. R. Eddins, Gulf States Utilities Co., described the full automation of an older plant (Riverside Station) which will be used for peaking with the individual units being started and stopped as required. One of the important facilities incorporated in the computer system is "Automatic Priority Interrupt." This prevents program functions of less importance or urgency from interrupting programming functions in progress, Eddins said. Several programs can be in progress at any time but the program with the highest order of priority takes precedence. This allows lengthy computations to progress in various stages and allows adequate control action and control supervision to be maintained at all times, he stated.

J. T. Smith, Jr., Georgia Power Co., stressed the imperative need for protecting rights of way so that: 1. They may prove to be an asset continually increasing in value from an investment viewpoint. 2. They may offer continuous and uninterrupted electric service from an operating viewpoint and 3. They may be preserved so as not to incur ill will of the public but to gain favor and approval.

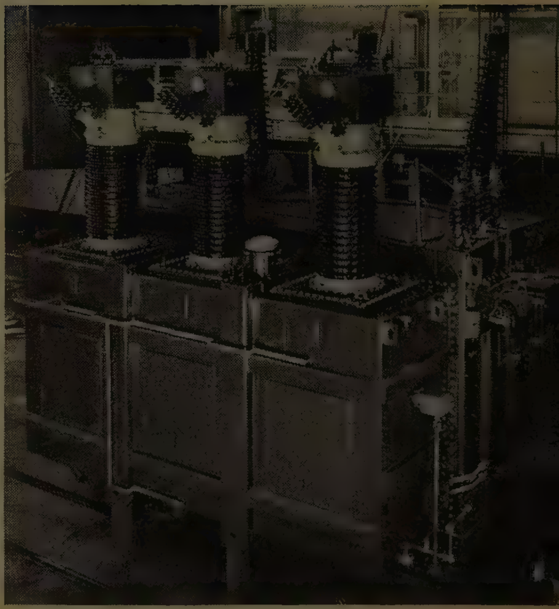
Here is how to reduce shipping weight and size, and improve efficiency, in high-voltage power transformers.

The new Westinghouse URH High-Voltage Load Tap Changer is designed for line voltage operation; eliminates the need for a series transformer. It also eliminates the preventive auto-transformer. Instead, a transition resistor is used, keeping current and voltage in phase for better arc interrupting conditions.

Its in-phase resistance-type transfer switching contributes to extra long contact life.

It's always on position, no matter where it stops in a tap change cycle.

With the new Westinghouse URH High-Voltage Load Tap Changer, the 200 mva transformer shown here has been reduced in weight, size and losses as compared with units utilizing conventional high-voltage load tap changing equipment. You can make similar savings on other sizes of Westinghouse power transformers. Ask your Westinghouse representative for details; or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.



This 200 mva Westinghouse transformer is the largest in the U.S. with resistance-switched high-voltage load tap changer. Shown on test, it is now installed at the Gardenville, N.Y., station of the New York State Electric and Gas Corporation to step down voltage from 230 to 120 kv. J-70955

YOU CAN BE SURE . . . IF IT'S **Westinghouse**

MANUFACTURERS-PRODUCTS

Westinghouse Builds Mobile Substation

A 7500-kva mobile substation, consisting of two trailers, was designed and built by Westinghouse for Florida Power & Light Company.

It was necessary to design the substation as a dual trailer unit to provide the electrical clearances for the 115-kv switching trailer, which includes the primary lightning arresters, fuses and disconnect switch, as well as to keep weights and dimensions within legal limits. The second trailer has the 7500-kva, 115-24/13.8/4.16-kv transformer mounted on it along with the low-voltage switchgear equipment.

G-E Mobile Displays Begin Tour

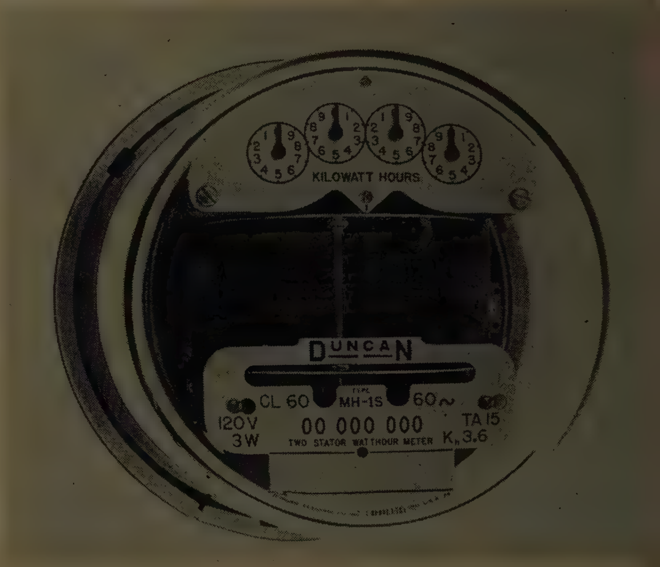
G-E's TRAN-VANS, four mobile displays of distribution transformer products began a combined 10,000-mile nationwide tour on March 27.

Carried in standard Corvan trucks, the mobile displays are designed to acquaint the nation's electric utilities with the total owning costs of distribution transformers and the product innovations being offered by GE.

The display units will include a sample of the revolutionary news encapsulated transformer, a new pad-mounted transformer and other transformer components, lightning arresters and cutouts.

The four TRAN-VAN displays will complete their tour about August 1. One unit will tour the Southern States and the Eastern seaboard area, another will tour the Southwest, a third unit will cover Missouri and the Pacific Northwest, and the fourth unit will cover remainder of the Midwest and New England.

New Polyphase Watthour Meter



The Duncan Electric Co., Lafayette, Indiana, has announced a new polyphase watthour meter—the MH-1S. The new meter has been under development and test for some time and is a simplified two-stator watthour meter, used for metering 3-wire network services. Construction has been simplified in the MH-1S by eliminating conventional full-load and light-load adjustments. This direct assembly keys the potential and current electromagnets in a die-casting operation and eliminates the need for core cleats.

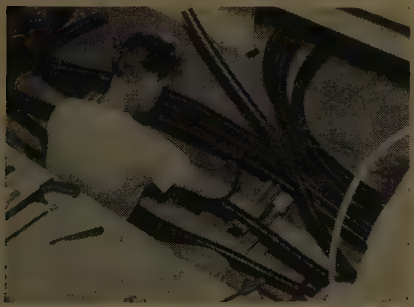
Initial calibration of the meter is made by adjusting the strength of the two pairs of side-mounted damping magnets. The fine adjustment is made with torque adjusting screws. A conventional lag adjustment is provided on the meter.

Simplified construction has eliminated the usual adjustments, reduced weight, increased stability, reduced the price, while retaining high quality load performance, the Duncan Company reports.

NAME YOUR CABLE PROBLEM— THERE'S A GOOD CHANCE DURASHEATH CAN SOLVE IT.

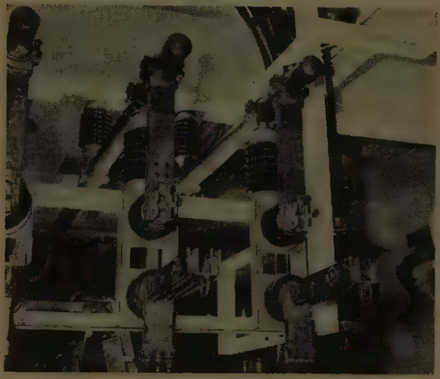
—because Durasheath's neoprene jacket and AB Butyl insulation last for years in practically any environment. Here are 5 examples.

Riser Cable. In this installation, Durasheath not only serves as an aerial cable, but also as a riser cable running down the side of the building. Without additional terminations, it then drops down-inside to the plants' power-control center. It's another example of the way versatile Anaconda Durasheath adapts itself to your power cable needs.

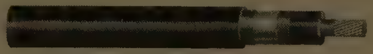


Installed in ducts. Durasheath's flexibility meant quick and easy installation here. And once installed, its tough neoprene jacket assures long, trouble-free life. Because Durasheath adapts itself to so many uses, your inventory problems are lessened—fewer cables need be carried in stock.

Field or factory-assembled aerial cable. Durasheath may be factory pre-assembled with standard or reverse lay. Or it can be quickly field assembled with the simple spinning operation shown here. Either way, easy splicing, tapping, and terminating result in simplified installation. No cross arms or insulators are needed.



Inside installation. Here's an application where Durasheath was quickly installed and easily terminated. Durasheath's Neoprene jacket resists abrasion, heat and fumes. *Assures dependable performance and long-range economy.*



ANACONDA DURASHEATH ALL-PURPOSE POWER CABLE is available in all sizes, single and multiple conductor, copper or aluminum, 600 to 35,000 volts. *Insulations:* Type RHW, Anaconda ANW, AHW, or AB butyl rubber compounds; each designed for specific purposes. *Jacket:* specially compounded neoprene with high resistance to flame, oil, acids, alkalies, sunlight, and ozone. Has high tensile strength and is flexible over a wide range of temperatures.

Direct-burial cable. The moisture-, oil-, and acid-resistance of Durasheath's jacket makes it the ideal cable for direct-in-the-ground applications like the one shown above. Its flexibility cuts installation time and cost because Durasheath is easy to handle. Its durability cuts maintenance costs.

For complete information about Anaconda Durasheath contact Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York, Department EFL-1-ELP.

61263U

ASK THE MAN FROM
ANACONDA®
FOR DURASHEATH ALL-PURPOSE POWER CABLE

SUPPLY FACILITIES

New Normalizing Line

This photo shows the new, 1040-ft continuous normalizing line for processing high-grade, grain-oriented silicon electrical strip steel at the Bagdad dept., West Leechburg Works of Allegheny Ludlum Steel Corp. This entry-end of the preheater shows three separate strips of electrical steel starting through the normalizing process. Normalizing is an operation in which steel is heated to a predetermined temperature and cooled under controlled atmosphere conditions. This refines the grain structure of the steel and makes it more uniform.

GE Modernizes Foundry

"An $800-thousand modernization of G-E's Elmira Gray Iron and Ductile Iron Foundry is aimed at putting the foundry ahead of the continuing sharp-competitive struggle," E. R. Oeschger, Foundry Department General Manager reported.

"Over 900 of the 3300 gray iron foundries which were in business in 1950 have gone out of business in the past decade," Oeschger said, "and the only way we can survive the struggle is to invest in superior facilities and provide constantly improving quality to our customers."

The modernization, which was begun almost two years ago, is now complete. Two new cupolas of advanced design and an automated chemical-analysis laboratory will provide lower cost metal and precise control of temperature and composition.

The foundry produces castings for G-E motors, electrical machinery, locomotives, generators, appliances, industrial controls and transformers. Consumers outside GE include machine tool, textile, glass mold, air conditioning, appliance, railroad, automotive and valve manufacturers.

The new melting facilities, which eliminated two melting areas, include the latest in technology and cinder collectors. Among other important improvements are: new design materials-handling equipment for charging material into the cupolas, an electric holding-furnace to provide improved temperature and composition control for the permanent-molding operation, building modifications, and dust and cinder suppression equipment.

G-E's foundry in Everett, Mass., will be closed and most operations transferred to Schenectady. It is expected that shutdown of the Everett facility will be completed by the end of the year.

Kaiser Adds New Facilities

New facilities for refining super purity aluminum have been installed at Kaiser Aluminum & Chemical Corporation's Mead, Wash., reduction plant, increasing by 55 percent the company's capacity to produce the 99.99 plus pure aluminum.

Five new specially designed refining cells—the largest of their type in the industry—currently are in full operation, according to J. H. Lindemuth, general manager of the company's metals division. Each cell has a rated capacity in excess of 380,000 lbs per year, making Kaiser Aluminum's production capacity for the metal more than 5.3-million lbs annually.

Kaiser Aluminum's super-pure metal is obtained by refining standard aluminum under carefully controlled conditions, so that the small amounts of impurities in the metal are reduced to a guaranteed maximum of 0.008, and as low as 0.002 percent.

Leading Management Consulting Firms Consolidate

Consolidation of Business Research Corporation, one of the oldest management-consulting firms in the Midwest, with the Central Regional Office of Ebasco Services Inc. in Chicago, was announced by Paul T. Weldon, president of Business Research, and Harold H. Scaff, vice president in charge of Ebasco's Management Consulting Division.

Business Research will operate as an integral part of Ebasco's organization in Chicago, with Mr. Weldon continuing as president.

"The services offered by these two well-established firms complement each other, and will provide clients in the Midwest with a broad range of management consulting services," according to Mr. Bradford, who is director of central regional operations for Ebasco.

Sales Briefs

Two new distributors have been announced by **Allis-Chalmers Industries** group. They are: **Robert B.**

Darling, New York City, and **Beltline Electric Co.**, Paducah, Ky.

Precision Multiple Controls, Inc. has named **Shaffer & Nelson, Inc.** as sales and service representative in the Pacific northwest, serving Washington, Oregon, Montana, Utah and Wyoming utilities. **Precision** field facilities in the Pacific northwest are rounded out in Alaska through representation by **John P. Bagoy Associates**, Anchorage. In the north central region, **Precision** distribution has been assigned to **Public Service Supply Co., Inc.**, Cleveland. **Precision** manufactures the two-component tubeless control used on multiple street-lighting systems.

Appointment of the **Esco Electrical Supply Co., Inc.**, Philadelphia and the **Herron Electrical Service Co.**, Lawrenceville, Ill., as control-equipment distributors, has been announced by **Allis-Chalmers Industries Group**. The **Herron Electrical Service Co.** will also distribute motors. The **Tri State Industrial Equipment Corp.**, Flushing, New York, has been appointed a distributor for **A-C** motors and control equipment in New York, Queens, Kings, Bronx, Westchester, and Nassau counties.

A-C has appointed the **Cal-Ore Machinery Co., Inc.**, Medford, Oregon and **Power Pumps, Inc.**, Long Beach, California, as West Coast distributors for motors, pumps and compressors, etc. Area served includes the state of Oregon; Clark Cowlitz, Skamania, Klickitat, and Wahkiakum counties in Washington, and Siskiyou, Modoc and Del Norte counties in California.

C & S Products Co. has announced the appointment of **John T. Hill** and **William M. Rambo** as representatives for **Semper-Seal**, a new epoxy-type cable splice and blocking compound, in Southern California and the State of Arizona. Hill and Rambo maintain offices in San Gabriel, California. **C & S Products** also announced the recent appointment of **Arthur F. Schultz**, New Hartford, New York as representative for **Semper-Seal** in New York State, from Albany west.

It
won't
be
long
now
!
Watch
for

the
LL-65

a
new
standard
in
distribution
transformers

- Thermal limit 180% of nameplate (same as 55°C unit).
- Offers lower impedance, which reduces regulation problems.
- Economic limit increased by lower losses.

Coming soon from Westinghouse

You can be sure...if it's Westinghouse

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

EVERSTICK
ANCHORS

For new construction and maintenance—Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resilient, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

Four Fine Facilities
in PITTSBURGH

ALLEGHENY MOTOR INN Opposite Greater Pittsburgh Airport. 60 air-conditioned rooms, tile bath, TV, radio, phone. Superb restaurant and cocktail lounge. Year-round swimming pool. Courtesy car to and from airport. AMherst 4-7700

HOTEL PITTSBURGHER In the heart of the Golden Triangle. 400 outside rooms, bath, TV, radio, air-conditioning. General Forbes Lounge & Dining Room. ATlantic 1-6970

JACKTOWN MOTOR HOTEL 1 mile west of Irwin Interchange on Route 30. 60 air-conditioned rooms, TV, telephone, combination tile bath. Facilities for dining and group parties. **UNderhill 3-2100**

HOTEL PITTSBURGHER MOTEL Opposite Greater Pittsburgh Airport. 56 air-conditioned rooms, tile bath, radio, TV, phone. Courtesy car to and from airport. AMherst 4-5162

KNOTT HOTELS

*Teletype Service. Telephone any Knott-Hotel. All Knott Hotels and offices in U.S. connected by teletype.

Joseph F. Duddy General Manager

MEN OF POWER

Cook

Donald C. Cook, executive vice president of the American Electric Power Service Corporation, has been elected vice president of the parent American Electric Power Company. He was subsequently appointed assistant to the president of AEP. He is also a director and member of the executive committee of AEP and vice president and director of each of its six operating subsidiaries.

Mr. Cook was a member of the Securities and Exchange Commission staff from 1935-45, becoming a commissioner in 1949, vice chairman in 1950 and chairman in 1952. He joined the AEP Service organization as vice president and director in 1953.

* * *

H. G. Dillin, executive vice president of San Diego Gas & Electric Company, has been elected president succeeding E. D. Sherwin who retired last month after 41 years with the company. Mr. Dillin has been with the company for 37 years, starting as a draftsman and holding successively more important positions in engineering and sales until reaching his former post in 1953.

* * *

Russell M. Grogan, manager of production, transmission and construction for the Long Island Lighting Company, has been elected vice president and will continue in charge of the same company functions. At the same board meeting, Charles R. Pierce was elected assistant secretary and Fred C. Eggerstedt, Jr., vice president-finance, was elected treasurer.

* * *

Anthony A. Jedrziewski, supervisor of lines engineering for West Penn Power Company, has been appointed supervisor of distribution planning. He was formerly a project engineer in planning and electrical engineering. He will headquarter at the Cabin Hill general office. Richard F. Pearson succeeds to the post of supervisor of lines engineering at Greensburg.

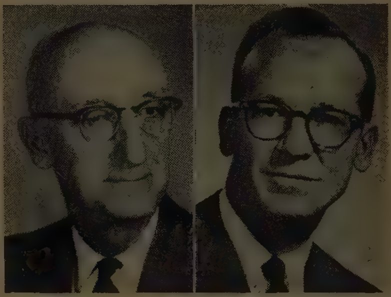
* * *

John C. Monday has been elected vice president and general manager of the Hapco Division of Hubbard and Company. He will be in charge of production, sales, engineering and related functions for that division.

* * *

New manager of the Area Development Department for Duquesne Light Company is Frank B. Mahon, formerly director of the department. He has been with the company since 1928 in various engineering and sales capacities except for two years with the War Production Board during World War II.

* * *



Mann Greenleaf

H. L. Mann, left, president of Iowa Southern Utilities Company, was named chairman of the board and chief executive officer last month, succeeding Edward L. Shutts who will continue as honorary chairman in an advisory capacity. Elected president at the same board meeting was R. W. Greenleaf, former executive vice president and treasurer.

In other management shifts, C. E. Parks, vice president engineering and operations, was given additional responsibilities; James R. Jones was promoted from assistant treasurer to treasurer, and J. E. Thomas from assistant general auditor to assistant treasurer. R. F. Brewer, manager of electric operations, was advanced to a new position of general manager-electric department.

C. G. Davis, a construction manager, T. A. Fearnside, manager of engineering, and F. R. Stevens, labor relations consultant, have all been elected vice presidents of Stone & Webster Engineering Corporation.

* * *

W. Herbert Lambert, superintendent of production, Pennsylvania Electric Company, has been appointed assistant to the vice president—technical. Succeeding to Mr. Lambert's former post is William A. Verrochi, formerly assistant superintendent of production.

* * *

Glenn Ray, administrative assistant for industrial relations, Indianapolis Power Company, has been elected assistant vice president-industrial relations. David E. Schnorr, legal department, was elected assistant secretary during the same board meeting.

Men of Power Briefs

Thomas L. Perkins, chairman of trustees of The Duke Endowment and prominent corporate legal council, was elected chairman of the board of directors of the Duke Power Company last month.

Charles E. Richards, assistant general superintendent of The Cleveland Electric Illuminating Company's Steam Power Division, has been promoted to superintendent of that division.

S. N. Fiala, vice president and chief engineer of the American Electric Power Service Corporation, was elected a director of the parent American Electric Power Company last month.

Eugene B. Sanford, Jr., consultant-engineering applications for General Electric Company's General Engineering Laboratory, has been named to a newly created post of administrator of Professional Relations, Electric Utility Engineering Operation.

Harry B. Munsell, chairman of the board, Kansas City Power & Light Company, died suddenly last month. He was president of the utility from 1947 until a year ago May when he became chairman.

FOREWARNED
is
FOREARMED!

WAIT

for the last word in

LOW-COST
REGULATION!!

COMING SOON
from Westinghouse

You can be sure . . . if it's Westinghouse

Andrew B. Speed, former sales engineer for Georgia Power Company in the Augusta division, has been named sales supervisor for the Columbus division.

Edward J. Murphy, assistant secretary of Stone & Webster Service Corporation, has been named secretary succeeding Carl Conley who retired.

Daniel Knowles, Jr., is the new Donaldsonville district manager for Louisiana Power & Light Company. He succeeds Lloyd Munson who retired May 1.

John R. O'Hanlon, assistant secretary of Potomac Electric Power Company, has been elected secretary replacing George Thompson who retired last March.

Paul Lenhart, New Jersey Power & Light Company assistant treasurer, retired last month after 35 years with NJ and an affiliate company.

J. A. Vaughan, director of research for Southern Wood Preserving Company, has announced his retirement effective July 5 following 40 years in wood preservation work. He will be available for consultation at P. O. Box 674, Crystal River, Florida.

Dr. Lowell T. Coggeshall, vice president of the University of Chicago, has been nominated a director of Commonwealth Edison Company.

Patrick Bingham is the new manager of engineering in General Electric's Gas Turbine Department.

R. G. Kenyon, retired (1958) vice president of Southern California Edison Company, died last month. He was well known in West Coast advertising circles and the PUAA.

Edward Frye, assistant to the Secretary of the Interior, has joined the staff of EEI. Among other duties he will serve as secretary to the task force on National Defense.

Ted E. Gaty, formerly with Line Material Industries, is the new sales manager for The Standard Transformer Company.

Edward J. Parker, sales manager of the St. Louis district for Rockbestos Wire & Cable Co., has been appointed Southeastern district sales manager, headquarters to be established in Birmingham.

E. D. Edwards, chairman of the board and president of Central Illinois Light Company until March, began his retirement May 1 after 38 years with the company.

Ernest D. Brockett, president of Gulf Oil Corporation, has been elected a director of Westinghouse Electric Corporation.

J. A. Keeth, retired Kansas City Power & Light Company vice president, returns to service as a newly elected director.

George L. Adams, prominent Natchez attorney, is a new director of Mississippi Power & Light Company.

H. M. Lind, assistant chief design engineer for Pacific Power & Light Company, has been named chief design engineer filling the vacancy caused by the retirement of Bruce Aaron. Joe Lienert, head of the substation design group, succeeds to Lind's former post.

Shannon C. Powers, general manager of National Electric division of H. K. Porter Company, has been elected vice president and general manager of that division.

G.E.'s Management R&D Institute Celebrates Fifth Anniversary

The General Electric Company's Management Research & Development Institute, the only school of its kind in the world, has just celebrated its fifth anniversary. Each nine-week's advanced management course (there are five a year) is attended by 60 executives. The institute is housed on the 32-acre former estate of the late Harry Arthur Hopf, (a pioneer management consultant) located in northern Westchester County, New York, about 35 miles northwest of New York City.

General Electric has erected two modern brick air conditioned buildings on the site—which house private rooms, lounges, dining hall, 6 conference rooms, a 100-seat assembly room, library and offices.

Other activities include educational relations and support service for all external Company educational activities, also the Company's decentralized educational programs for employees conducted at plant level. The Institute also houses the Management Research Service—a portion of Management Consultation Services.

This facility comes under G.E.'s Relations Services, headed by Jack Parker, vice president.

Biography of S. Z. Mitchell Is Broad Industry Study Too

S. Z. Mitchell was a most unusual man. More than this, his capacity for organization and foresight was instrumental in the early development of the electric utility industry.

Undoubtedly, there are many readers who have never heard of Mr. Mitchell. For the benefit of these readers, and those others whose minds need a little refreshing, he was a pioneer in the utility field and headed the Electric Bond and Share Co. until his death in 1933.

This story, written by his son, Sidney Mitchell, is a biography of Mr. Mitchell; it is also a biography of the beginnings of the electric-utility industry.

When S. Z. Mitchell turned in his Navy commission in 1885, everybody was reading Huckleberry Finn, which Mark Twain had just published. Francis Hodgson Burnett was writing Little Lord Fauntleroy. The base of the still-to-be-erected Statue of Liberty was being engraved . . . "Give me your tired, your homeless, your huddled masses yearning to be free." The railroads dominated the West. The big trusts were just beginning to get started. This was the United States when Thomas Edison gave young Mitchell his first job.

Shortly thereafter, the young man headed for the Pacific Northwest, in partnership with a fellow Navy officer, to become the sole agent for the Edison Electric Light Co.

In the west he sold, built, repaired, and financed local electrical development. His wealth grew, and so did his stature in the young industry.

What happened after his western days, and how his genius built an empire, is a page out of the electrical industry's history. And the book gives excellent insight into the workings of holding companies and their losing battle with the Federa government to avoid destruction It is a book well worth reading.

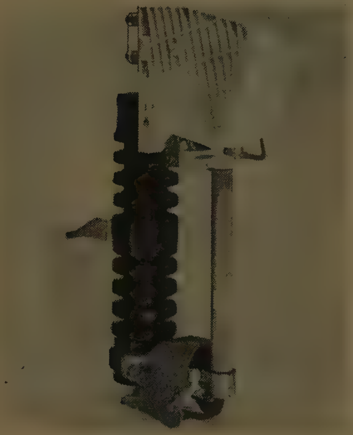
S. Z. Mitchell and the Electrical Industry, by Sidney Alexander Mitchell, Farrar, Straus & Cudahy, New York, N.Y. $5.00

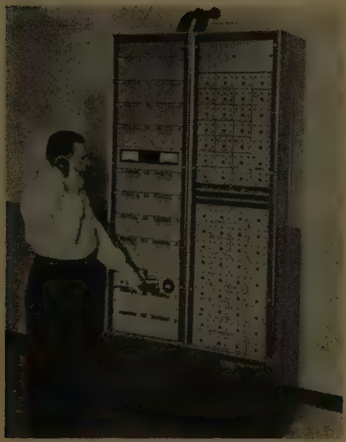
NEW PRODUCT DESIGN

Built-In Load Break Cutouts

Distribution cutouts (LBU) from **Westinghouse Electric Corp.** have built-in load break. Also available without load break (LDX). Load break can operate repeatedly for the life of the cutout without maintenance or replacement of parts. Also, it requires no special tools and is safe for linemen to operate with an ordinary hookstick without danger of flash burns. Load current is normally carried through the main contacts (and the fuse link).

Circle item #1 on reply card





Transistorized Microwave Package

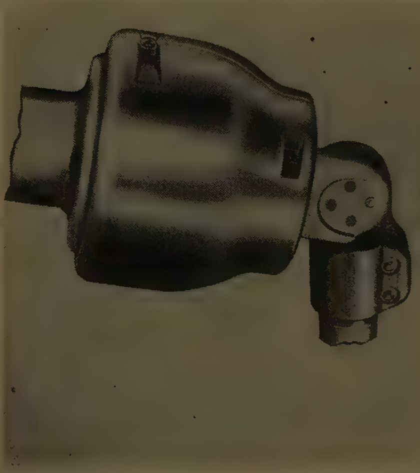
Transistorized microwave package by **Motorola** includes new RF. multiplex, telegraph carrier and alarm equipment. Labelled The 50 Series, RF equipment is designated MR-50; the multiplex is MC-50; telegraph carrier is MT-50; and the alarm system is MA-50. All four equipments in the new package incorporate modular construction and etched circuit cards for ease in servicing. Pull out drawers enable "in service" maintenance from the front of the racks.

Circle item #2 on reply card

Fittings Suppress Corona

Weld-type corona-suppressing electrical bus fittings by **Southern States Equipment Corp.** are available for various high voltages. Expansion stud connector shown is designed for corona-free operation up to 345 kv. Other arrangements are available for application at 460 kv. Integral-shield design eliminates the need for external grading rings. Expansion unit is welded construction throughout. Recessed bolts mount unit at desired angle to stud clamp.

Circle item #3 on reply card



Improve 69-kv Power CB

A 69-kv power circuit breaker, with Kool-Arc interrupters by **Power Circuit Breakers Div. of I-T-E** is called Type "KM" subtransmission breaker. The Kool-Arc provides shorter arcing time and reduces the degree of contact erosion and oil deterioration. Kool-Arc tube is of high-strength, warp-proof, non-absorbent fiberglas and epoxy construction. The overall smaller size of the vertical interrupter assures greater internal clearances and permits a reduction in tank diameters.

Circle item #4 on reply card

Capacitor Control

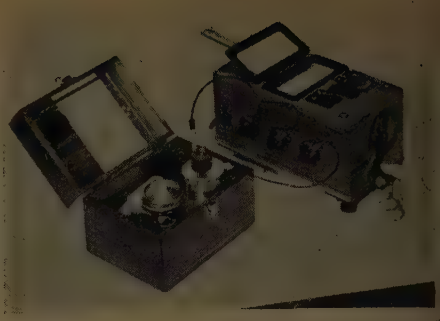
Voltage-sensitive, current-bias capacitor switching control by **Allis-Chalmers** can be completely installed in less than half the time it takes to setup existing controls, with corresponding cost reduction. Time saving element is in the current signal source. Instead of a current transformer, a post insulator with a pick-up coil in its base is used. Pickup coil has a voltage output proportional to the line current in the order of 1 v/60 amps.

Circle item #5 on reply card

From the biggest name in distribution transformers . . . watch for the

LL-65

You can be sure . . . if it's Westinghouse



Test Cell Kit for Liquids

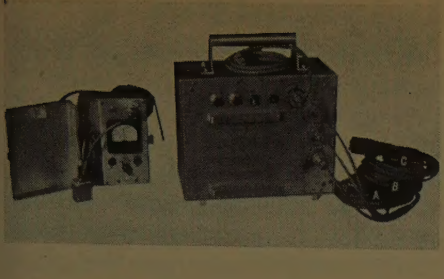
Complete kit by **James G. Biddle Co.** for use with a Megger insulation tester in making measurements of the resistivity of liquids is called the Biddle-Balsbaugh Cell. Packaged as a kit with jar for storing the cell free from contamination while not in use. Jar hold appropriate solvents and a spring fixture for securing cell when it is immersed in the solvent between tests. Aluminum beaker and polyethylene-coated paper cups provided.

Circle item #6 on reply card

Underground Plastic Fittings

Belled-end fittings by **Tube Turns Plastics Inc.**, facilitate inserting power cables at the start of underground conduits of thermoplastic pipe. They are fabricated from stock sizes of polypropylene, polyethylene, polyvinyl chloride or other thermoplastic piping. One bell-shaped end flares to about twice the outside diameter of the pipe. The other end is normal pipe size for coupling by heat sealing, or solvent cementing in the case of PVC, to runs of plastic pipe used to guard underground power lines against corrosion and electrolytic action.

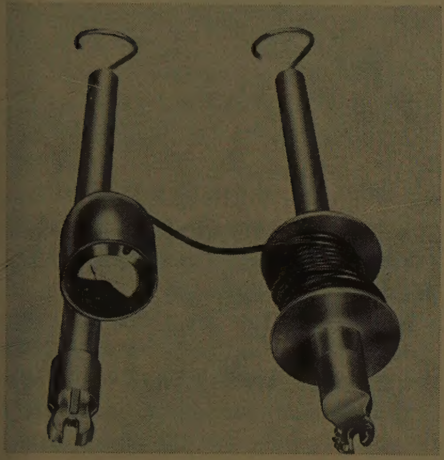
Circle item #7 on reply card



Identifies Cable and Phase

Coded impulse system by **Davenport Mfg. Div. of Duncan Electric Co., Inc.** identifies cable and phase. It consists of a capacitor discharge transmitter and battery-operated, transistorized detector. This method eliminates the need for spearing cables, disconnecting transformers or disturbing cable sheath or covering. It can be used for identifying single- or two-conductor cables as well as three-phase control cables.

Circle item #8 on reply card



Phasing Tester

Phasing tester by **A. B. Chance Co.** consists of two high resistant units and a voltmeter mounted on two Epoxiglas insulated housings. The two housings are joined by 22 ft of 15-kv insulated flexible cable. Using universal poles connected to the bottom of the housings, a lineman can safely hook the resistor hooks over the conductors. The tester is first connected across phases on each line to determine if both are energized. It is then hooked over a conductor of one circuit and to the corresponding phase of the other circuit to make certain that the phases will not be incorrectly connected.

Circle item #9 on reply card

Now

Sangamo Lincoln Combination Meters have TRUE MAGNETIC FLOTATION

New from Sangamo—singlephase and polyphase combination kwh/thermal kw demand meters with the moving system that *floats* on a magnetic field created by specially bonded Alnico magnets.

The singlephase J3T combines Sangamo's new J3 watthour meter and the Lincoln watt demand meter into a single unit. PW polyphase meters combine Sangamo's new P20 two stator watthour meters with two element Lincoln watt demand meters. The magnetic floating system further increases the established dependability of these combination thermal meters.

These new meters are compact and use conventional round covers. They retain the proven advantages of previous Lincoln demand meters: independent watt demand and watthour measurement, dual range, sectionalized construction, and interchangeability.

Your Sangamo Representative has the full story on both the J3T and PW meters. Ask him to show you these new developments in demand meters from Sangamo . . . the acknowledged leader in demand measurement.

SANGAMO ELECTRIC COMPANY

SANGAMO SPRINGFIELD, ILLINOIS

PW61-6

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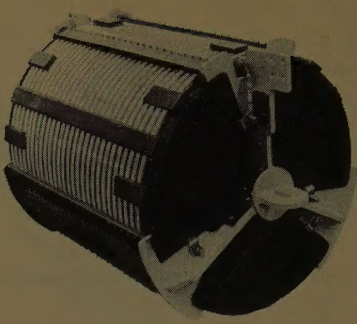
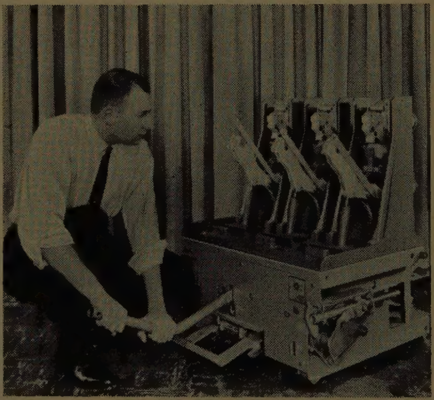


Hot Line Ammeter

Hot Ammeter by **Bodendieck Tool Co.** is a tong-test device which utilizes a fixed air gap on the magnetic pickup core to provide four percent accuracy in the ranges 0 to 400, 0 to 100 and 0 to 40, on high and low voltage lines. The absence of moving parts on the pickup allows the instrument to retain its accuracy with a minimum of maintenance. Special trigger sticks are not required for hot applications.

Circle item #11 on reply card



Continuous Rotating Booms

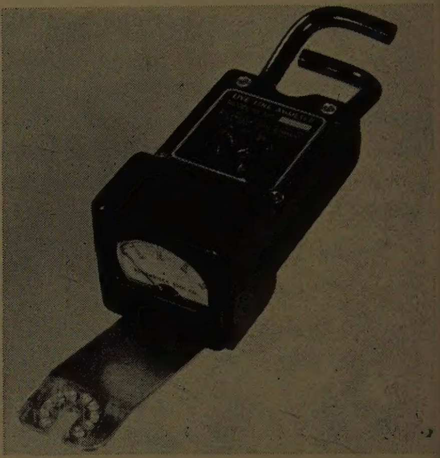
Three models of the Commander series hydraulic, continuous 360 degree rotating derricks by **Tel-E-Lect Products, Inc.** horizontally lift 2000 lb with stinger extended to 23 ft and 8000 lb with derrick at 80 degrees. Sheave height is 33 ft, stinger extended. At 80 degrees, the radius from derrick center for working within the body area, is 22 in., stinger retracted; 39 in., stinger extended.

Circle item #13 on reply card

Aluminum Line Traps

Aluminum line traps by **Westinghouse Electric Corp.** weigh 33 percent less and have correspondingly improved strength-to-weight ratio. Available in ratings of 400, 800, 1200 and 1600 amps continuous. Short time ratings range from 15,000 to 44,000 rms amps. Weight of the 400-amp unit—200 lbs; the 1200-amp unit—700 lbs. Coils are wound of continuous multistrand aluminum strap; end brackets are made from aluminum plates.

Circle item #10 on reply card



13.8-kv Breakers, Switchgear

New 13.8-kv equipment by **I-T-E Circuit Breaker Co.** incorporates completely new design from ground up, specifically for stored-energy closing. Gear affords closed-door drawout and indication of breaker's position in compartment, face-round blowout coils, virtual elimination of need for adjustments, ease of maintenance, faster closing of contacts and faster fault interruptions, smaller size and floor area, and low center of gravity.

Circle item #12 on reply card

AUTOTRANSFORMERS . . .

(*Continued from page 40*)

The approximate saving in cost of selecting an autotransformer instead of a two-winding transformer can be determined from the equations given. An autotransformer with kva eq. of 50,000 will cost about the same as a 50,000-kva two-winding transformer. If a 10-percent tertiary is required, add two percent to the price of the autotransformer.

The 50-mva equivalent autotransformer will have the same physical size and the same losses as a 50-mva two-winding transformer. Two percent should be added to dimensions and weight and five percent should be added to losses if a 10-percent tertiary is used on the autotransformer.

The tertiary winding of an autotransformer should not be overlooked as a convenient source of power for capacitors or a synchronous condenser. It may also be used to furnish station power or serve some local loads.

Fig. 3 illustrates a step-down autotransformer with a load on the TV winding. Arrows illustrate relative direction of current flow. If the TV load has the same power factor as LV load, the current in this common part of the autotransformer is reduced. This reduction allows the HV to carry slightly higher than normal current. Fig. 4 illustrates a step-up autotransformer with a load on the tertiary winding. Here the current in the main winding of the autotransformer resulting from the tertiary load increases the current in the common winding.

A 200-mva autotransformer 230 kv to 115 kv with zero load on tertiary is illustrated in Fig. 5 (step down) and Fig. 6 (step up). The current, in both the common and series windings, is 502 amperes. Fig. 7 shows the same transformer with a 30-mva, zero-percent power factor, capacitive load on the tertiary and a lagging load of 200 mva at 99-percent PF on the LV. The current in the common winding actually decreases to 501 amperes. Thus, capacitive loads can be carried at no additional cost for the autotransformer, except for the additional cooling required by added losses in the TV winding.

The effect of the same TV load on a step-up transformer is shown in Fig. 8. The common-winding current is now increased to 512 amperes and the winding must be designed for this additional current.

Use of a TV for supplying power must be studied and each loading condition analyzed by calculating currents in all windings. Formulas are available to cover all conditions of operation.

Load Tap Changing

The use of LTC (load tap changing) on autotransformers can be more difficult than on a two-winding unit. High-voltage units are usually Y connected and solidly grounded. The LTC can be placed directly in the neutral of a two-winding transformer, but such an application produces unsatisfactory results when used on an autotransformer.

The usual connection for LTC on autotransformers is shown in Fig. 9. Fig. 10 shows the application of a LTC in the HV winding. In both cases a series transformer is shown. This series transformer increases the weight, dimensions and losses.

This handicap to the autotransformer is being overcome by the use of a HV-LTC mechanism directly in the line end of an autotransformer—see Fig. 11.

The biggest problem is to insulate the tap leads and the mechanism itself for impulse and surge voltages to ground. This has been done before with tap changers for de-energized operation, so no major design problems were introduced for taps and tap-selector switches. The contactor used to break the load is generally mounted on the end of a porcelain bushing in a compartment on the side of the transformer.

Line tap changers have been supplied on autotransformers up to 230 kv. The saving in weight by eliminating the series transformer can be 25 percent, while the saving in losses can be 15 to 20 percent. The reduction in weight allows shipment of larger units in one piece, thus reducing installation costs.

Table I shows comparisons of prices, losses, regulation, weights and floor space for autotransformers and two-winding units.

WATCH PHASE DESIGNATION

(*Continued from page 41*)

from phase C we come back to phase B; etc. However, all connections are correct and the loop operates satisfactorily. Only the phase designation is confusing.

Second Convention Better for Loop

To obtain a correct phase designation, the second convention should be used for wye-delta or delta-wye transformer. The system under discussion is shown in Fig. 2, with the phase designation according to the second convention.

Starting with phase A at any point on the system, we will come back to the same phase A. There is no confusion with phase designation using this convention. Besides, the second convention is very convenient in system analysis since a shift of ± 90 degrees can be represented simply by multiplication or division by operator j. In most technical literature[4,5,6,7] on power system analysis the second convention is used.

The application of the Uniform System in the case under consideration will lead to the same results as the second convention.

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CALENDAR OF EVENTS

June 4—ECAP Management Meeting, Hotel Pierre, New York, N. Y.

June 5-7—29th EEI Annual Convention, Waldorf Astoria, New York, N. Y.

June 6-8—International Instrument-Automation Conference and Exhibit, Royal York Hotel, Toronto, Canada.

June 11-14—ASME Summer Annual Meeting, Statler Hilton Hotel, Los Angeles, Calif.

June 11-13—Wisconsin Utilities Association, Accounting Section Conference, Dell View Hotel, Lake Delton, Wis.

June 13-14—National Safety Council, Public Utilities Section, Executive Committee, Laurentien Hotel, Montreal, Quebec, Can.

June 18-23 — AIEE Summer General Meeting, Cornell University, Ithaca, N. Y.

June 21-23 — National Committee on Utility Radios, The Nationwide Inn, Columbus, Ohio.

June 22-23 — EEI Residential Electric Heating & Air Conditioning Committee, Williamsburg, Va.

June 25-28 — 54th Annual Meeting, American Society of Agricultural Engineers, Iowa State University, Ames, Iowa.

June 26-28—American Society of Heating, Refrigerating and Air Conditioning Engineers Annual Meeting, Denver, Colo.

June 28-30—American Institute of Electrical Engineers, Instrument Society of America, American Institute of Chemical Engineers, American Society of Mechanical Engineers, Institute of Radio Engineers, Second Joint Automatic Control Conference, University of Colorado, Boulder, Colo.

June 28-30—NRECA Board of Directors Meeting, NRECA Building, Washington, D. C.

July 25-Aug. 10—1961 Chicago International Trade Fair, McCormick Place, Chicago, Ill.

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